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A STUDY OF AFRICAN CHIRONOMIDAE

PART I

PAUL FREEMAN

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 4 No. 1
LONDON: 1955

A STUDY OF AFRICAN CHIRONOMIDAE
PART I

BY

PAUL FREEMAN

Pp. 1—67, *Pl. I*; 15 *Text-figures.*

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THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 4 No. 1
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THE BRITISH MUSEUM

Issued November, 1955 *Price Fifteen Shillings*

A STUDY OF THE CHIRONOMIDAE (DIPTERA) OF AFRICA SOUTH OF THE SAHARA

PART I

By PAUL FREEMAN

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SYNOPSIS

This is the first of a series of papers describing as far as it is at present possible the Chironomid fauna of Africa south of the Sahara. The introductory matter includes a historical survey of the numbers and distribution of species hitherto described; notes on collecting, preserving and examining specimens; a brief account of the distribution of some of the commoner species; and finally short chapters on the structure and variation of the adults with special reference to characters of taxonomic importance.

There is a key to the subfamilies followed by keys and descriptions of the genera and African species of the subfamilies Tanypodinae, Diamesinae and Clunioninae. A key to the genera only is given of the Podominae, of which no African species are yet known. Descriptions are given of new species and redescriptions where possible of those previously described both by the present and other authors. Fifty-seven species are dealt with, nineteen of them new, and there is a good deal of new synonymy.

This is the first part of a study of the adult Chironomid fauna of the mainland of Africa south of the Sahara, based mainly on the collection of the British Museum (Natural History), supplemented by those of the Institut des Parcs Nationaux du Congo Belge, the Musée Royal du Congo Belge and the Institut Royal des Sciences Naturelles de Belgique. I consider the Ceratopogonidae to be a separate family.

The study is not a revision in the strict sense because I have not been able to identify all the species (nearly 300) described by Kieffer. I am, however, including as many

redescriptions of his species and genera as possible, and notes on all the others. I am also describing new species, redescribing both Goetghebuer's and my own species, and giving keys and figures to assist in dentifications. It is hoped that publication of the study will encourage collecting so that the remainder of Kieffer's species may be found again.

Africa south of the Sahara and the associated islands off the east coast are usually referred to by zoologists as the " Ethiopian Zoogeographical Region." It is not a very satisfactory term because Ethiopia is the name of a country and therefore there is confusion when the adjective " Ethiopian " is used. I am not including a full account of the fauna of the Malagasy Sub-region (Madagascar and associated islands), except for the Seychelles, because I have no material from there. I am, however, including such account as is possible of the material from the Seychelles collected by the Percy Sladen Trust Expedition 1905 and reported on by Kieffer. Some Sudanese species extend along the Nile into Lower Egypt and for these species it is necessary to extend the limits of the Region under consideration. With this exception, wherever I have used the adjective " African " I am meaning Africa south of the Sahara.

I wish to thank Dr. A. J. Hesse of the South African Museum, Cape Town, for lending me the types of S. African species described by Kieffer ; also Dr. Ferenc Mihalyi of the Hungarian National Museum for the loan of other Kieffer types.

I would like to thank the Director of the Institut des Parcs Nationaux du Congo Belge, Dr. P. L. G. Benoit of the Musée Royal du Congo Belge and Dr. Per Brinck of the Lund Universitets Zoologiska Institution for placing the large collections of their Institutes at my disposal.

Dr. K. M. F. Scott and Mr. A. D. Harrison of the University of Cape Town have made big collections of specimens in excellent condition and I am much indebted to them, both for sending me the material for working out and for presenting much of it, including the types of new species, to the British Museum (N. H.).

Other large collections have been sent to me from the Anglo-Egyptian Sudan by Mr. D. J. Lewis, Stack Medical Laboratory, and by Mr. E. T. M. Reid, Tsetse-fly Reclamation Service. Smaller lots of material have been received from M. R. Tollet, Institut Royal des Sciences Naturelles de Belgique ; Dr. A. Villiers, Institut Français d'Afrique Noire, Dakar ; M. J. Hamon, S.G.H.M.P., Bobo Dioulasso, Haute Volta ; Mr. R. Crosskey, Medical Dept., Nigeria; Prof. Dr. Fritz Peus, Zoologisches Museum der Universität, Berlin ; and Prof. Dr. E. Lindner, Staatliches Museum für Naturkunde, Stuttgart. I wish to give my thanks to all these for their co-operation.

The British Museum material includes the collections made by the late Dr. F. W. Edwards on the British Museum Ruwenzori Expedition (1934–5).

HISTORICAL SURVEY

Single species of African Chironomidae have been described by Walker, Wiedemann, Edwards, Hesse and Hinton, but prior to 1950 the vast majority of known species were described by Kieffer and Goetghebuer. Since 1950 and prior to the publication

of this study I have published descriptions of a number of species. The numbers involved are as follows :

Kieffer . .	.	286 species
Goetghebuer .	.	82 ,,
Freeman .	.	78 ,,
Other Authors	.	6 ,,
		,,
		452

Goetghebuer's material is preserved in the Musée Royal du Congo Belge, Tervuren; there is type material of practically all my species in the British Museum (N. H.). Of the material examined by Kieffer, however, there seems to be little left. I have seen the types of nearly 90 species located in the British Museum, in the Museum National d'Histoire Naturelle, Paris, in the Hungarian National Museum, and in the South African Museum, Cape Town. The types of the remainder appear to be lost.

Kieffer wrote twelve papers between 1908 and 1925 either entirely on material from Africa south of the Sahara or containing descriptions of species from that Region. Some African species are to be found in Egypt and at least one in Palestine ; it is therefore necessary to study his papers on Egyptian material. His most important papers on the African fauna are the series of three under the title " Chironomides de l'Afrique Equatorial " (*Ann. Soc. ent. France*, 1921–3). In these he described 158 new species and 28 new genera. Despite the fact that Kieffer gave keys to both genera and species, Goetghebuer was able to recognize only three of his new genera and three of his species.

The material studied by Kieffer was almost all preserved in alcohol, whereas that available to Goetghebuer and myself is mostly pinned. Specimens preserved in spirit tend to be much paler than those that are pinned, the colours fade more easily and the pruinosity is invisible. This means that more attention has to be paid to the structural characters mentioned by Kieffer than to the colour characters. Although this might seem to be an advantage owing to the variability of colour characters, in fact it is not, because he often used head characters which are generic rather than specific and minute tarsal characters which are extremely difficult to see and to appreciate. Female Chironomids are notoriously difficult to identify, but Kieffer described 46 species from females devoid of wing markings or other distinctive features. These will probably never be recognized.

At the time of writing I have been able to recognize about 130 of Kieffer's species and about 12 of his genera based on African material. Nearly every collection sent to me contains at least one of his species which is new to me. The feature which I find most puzzling in his work is the abundance of species described by him and unknown to me with striking characters of wing and leg markings, and the absence in his papers of descriptions of species which to me are common.

Kieffer's work was very erratic. Some of his descriptions are accurate and render the species recognizable easily and with confidence. These are usually species with clear-cut markings or distinctive structural features which he has figured. If the markings are not clear-cut or are at all complex then they are difficult to interpret

from any description and a figure is essential. Unfortunately Kieffer did not figure wing or leg markings for any species.

Some of his hypopygial figures seem fairly accurate, but others do not inspire confidence and they may have been drawn from poor mounts. Most of his type specimens are lacking hypopygia, but in one instance (*Chironomus ornatipennis* Kieffer = *Polypedilum alticola* Kieffer) the hypopygium is present, mounted in ordinary gum on one of the data labels beneath the specimen. It is distorted and accounts for the figure (*Ann. Mus. nat. Hung.* **16** : 69) in which the styles as drawn are quite unlike those of a specimen with them properly expanded. I have remounted this hypopygium in balsam to show the correct appearance. If many of his drawings were made from mounts like this it will account for much of the difficulty in recognizing his species even when figures are given.

His concept of the genera was very uncertain. In 1914 he described *Polypedilum alticola*, placing it quite correctly into that genus, of which it is a large, well marked, typical species. However, in 1918, he again described it as a new species, but this time as *Chironomus ornatipennis*. In fact, of the six species placed in *Chironomus* in this later paper, examination of the types shows that only one really belongs to this genus in its strictest sense (as used by Kieffer) : two belong to *Polypedilum*, one to *Nilodorum*, one to *Cryptochironomus* and one seems best placed in the genus which he later described as *Kribiomimus*. There are many other examples of errors of this type which help to make his work so difficult to interpret.

In addition, some species seem to have been described over and over again not only in different papers but even in the same one. Examples of this are afforded by *Pentaneura pictipes* which he seems to have described four times in the same paper and a fifth time in a later paper ; and *Chironomus palustris* which he described later as *C. iricolor* and *Calochironomus oxylabis*.

To complete the recognition of Kieffer's species much more collecting in the type localities will be necessary. As proof of this, his 1921–3 papers contain descriptions of between 60 and 70 new species and 8 new genera from southern Anglo-Egyptian Sudan. This is an area from which I have much material and I have been able to recognize no less than 40 of these species and 7 of the genera. From this it can be inferred that further collecting in other areas will enable many more of his species to be found again (see further under " Biology and Distribution ").

The big collections available to me have come from Anglo-Egyptian Sudan (Lewis and Reid), South Africa (Scott, Harrison and Brinck) and Belgian Congo, Parc National Albert. I have smaller collections from other parts of Africa, especially Uganda, Kenya, Gold Coast and Nigeria, but very few from the forested areas.

I hope that publication of this study will encourage entomologists in Africa to collect more Chironomidae, especially at light. Regular collections over a long period will probably add enormously to the knowledge of the family.

COLLECTING, PRESERVATION AND EXAMINATION

Chironomidae come readily to light, although I have no information as to whether this applies to all species or even equally to both sexes of the same species. Most

of the material available to Kieffer and much of that in the British Museum was taken at light. The males are also easily caught with a net in their mating swarms. Both sexes can be found on vegetation, etc., near water. Mating pairs can be obtained by watching the swarms until a female appears and mates with one of the males ; the pair drops to the ground and can be captured.

Nearly all the material described by Kieffer and much that is collected at the present time is preserved in spirit. So far as I know, the only advantages of this method of preservation are ease of collecting and the ease of making a superficial examination of the male hypopygium. Preservation in spirit has the following disadvantages :

(1). The colours fade and the specimens are always paler than in life.

(2). The pruinosity is masked, and surfaces which are dull may appear shining.

(3). Hairs, especially wing macrotrichia, fall off.

(4). Wing veins become transparent and difficult to see.

(5). Antennae and legs soon break off, especially if the specimens are sent through the post.

(6) The specimens do not macerate well in 10% potash and become very transparent and difficult to handle.

(7) Examination is not easy, as it is difficult to fix the specimens in any desired position.

On the other hand, dried specimens mounted either on the tips of stainless steel points or else stuck on small card triangles with gum or celluloid solution, have none of these disadvantages, although they are fragile and easily attacked by pests. In my opinion all material should be preserved dry because ease of examination and maceration combined with retention of colours, hairs, legs, etc., greatly outweigh such disadvantages as are inherent in dried collections.

Chironomids are very fragile and should not be left long in the killing bottle to shake about and break up ; also large bodied insects should be kept away from them to avoid damage. When killed, they can be placed between layers of cellulose wadding for later mounting and examination, if it is not convenient to mount them immediately.

Most of the characters can be seen without slide mounting, but mounting is essential for male hypopygia and occasionally for wings or tarsal structures. I prefer to use Canada balsam after staining for about 10 minutes in a 1% solution of acid fuchsin in 20% alcohol. Where balsam is impracticable, " euparal " is probably equally effective. Gum-chloral media such as De Faur's mountant, are not good, as the shrinkage in drying invariably causes collapse of the hypopygia. I have no experience of polyvinyl alcohol media, but they are probably of no use with a water soluble stain such as acid fuchsin.

Mounts may be made on slides, but care must be taken that hypopygia are not crushed by the cover slip. I do not use slides for hypopygia but prefer to mount them in a drop of balsam placed on a strip of cover slip which is glued with celluloid solution to a small piece of card. No cover is used and the mount can be impaled through the card by the same pin that carries the specimen from which the hypopygium was taken. I find these mounts simple to make and easy to examine.

If necessary they can be remounted in different positions after dissolving the balsam in a mixture of xylol and absolute alcohol.

BIOLOGY AND DISTRIBUTION

Very little is known of the life histories of the African Chironomidae, but there seems to be no reason to assume that in general they will prove to be much different from the life histories of European species belonging to the same genera. So far as I know, detailed information is available only for the species *Polypedilum vanderplanki* Hinton, the larva of which has been shown by Hinton (1951, *Proc. zool. Soc. Lond.* **121** : 371–80) to be very resistant to desiccation. Larvae of this species can be dried for at least one and a half years after which time more than 90% of them can be reactivated by placing in water.

A notable feature of the African fauna is the comparative scarcity of the Orthocladiinae as compared with their abundance in individuals and species in the Palaearctic Region. Entomologists working with the Palaearctic fauna have found that the Orthocladiinae are especially typical of cold water habitats. This seems to apply also to the African fauna where some Orthocladiinae occur in the mountains of tropical Africa and at lower levels in the cooler climate of South Africa. For similar reasons the Diamesinae are represented by a single species and the Podominae not at all.

It is difficult to form any conclusions about the geographical distribution of the species on the basis of the relatively small amount of Chironomid material so far collected, but it does seem that many of the species are widely distributed. Edwards has noted in the British Chironomid fauna (1929, *Trans. ent. Soc. Lond.* **77** : 282), though of course the scale is quite different, that their distribution is governed by the distribution of water ecologically suited to each species rather than by other considerations.

In his 1921–3 papers on the Equatorial African Chironomid fauna, Kieffer described more than 150 species ; 89 of these were from Kribi in the French Cameroons, 68 were from the southern Anglo-Egyptian Sudan and in each case about half the species were described from the female alone. I have identified more than 40 of the Sudanese species but less than a dozen of the Kribi species. A conclusion which may be drawn is that the collections at my disposal do not include enough species from the forested parts of Africa for me to identify the Kribi species. On the other hand, as Kribi is on the coast it may not be typical of the Guinean Forest proper.

In point of fact I have little material from the forested areas, the bulk of the collections available to me being from Anglo-Egyptian Sudan, East Africa and South Africa, with additional small collections from the Gold Coast, Nigeria and French West Africa. I have been singularly unsuccessful in my searches amongst this material for the species described by Kieffer from Kribi. The same thing is true of the collections studied by Goetgehbuer. He described over 80 species from the Belgian Congo, but only twelve or so of these came from the Guinean Forest ; the remainder were from the higher eastern and southern parts of the Belgian Congo.

One of the species described by Kieffer from Kribi as *Kribiocosmus ornatipes* has

an interesting distribution. My material of it comes from the Gold Coast (Koforidua), French Sudan (Bamako) and the Belgian Congo (Stanleyville). The first two of these localities are right outside the Guinean Forest, which suggests that this species at least is not a forest one. If this applied generally to the Kribi species I would expect more of them to have been present in the collections available to me. As so few of the species are known to me, it seems quite probable that there is a fauna, fairly rich in species, associated with the Guinean Forest Province of the West African Zoogeographical Subregion, but which has not been collected to any extent since Kieffer wrote his 1921–3 papers.

Outside the Guinean Forest some species show a generalized Sudano-Zambesian distribution, being found in West Africa (Gold Coast, Nigeria), Anglo-Egyptian Sudan, East Africa, and South Africa. Examples of such species are :

Pentaneura nilotica Kieffer.
P. cygnus Kieffer.
Clinotanypus claripennis Kieffer.
Procladius albitalus sp. nov.
Chironomus palustris Kieffer.
Nilodorum brevibucca Kieffer.

Species with a typical East African distribution from South Africa northwards to the Sudan include the following :

Pentaneura trifascia Freeman.
P. dusoleili Goetghebuer.
Tanypus guttatipennis Goetghebuer.
Procladius brevipetiolatus Goetghebuer.
Chironomus sensualis Kieffer.
C. albomarginatus Kieffer.
Cryptochironomus subovatus Freeman.
Polypedilum alticola Kieffer.

The following species are known so far only from South Africa :

Anatopynia marmorata sp. nov.
A. unicolor Freeman.
Chironomus caffrarius Kieffer.
Microtendipes lamprogaster Kieffer.

There is insufficient material available for me to go into greater detail at the present stage, because so many of the species are known only from one or two localities.

STRUCTURE

In this Section are described mainly the parts of the adult which are used in classification.

Head.

Although Kieffer often mentioned the shape of the head, I have rarely found it to be of value for separating species. It is generally wider than it is high. In the

subfamily Chironominae, just above the antennae, there may be a pair of small lobes known as the frontal tubercles (Text-fig. 1, *c*).

The eyes are large, sometimes (Orthocladiinae) reniform, sometimes with a long dorsal narrow portion. In some genera (e.g. *Clinotanypus*) there is a pronounced sexual difference in the eyes, those of the male having a long dorsal narrow portion,

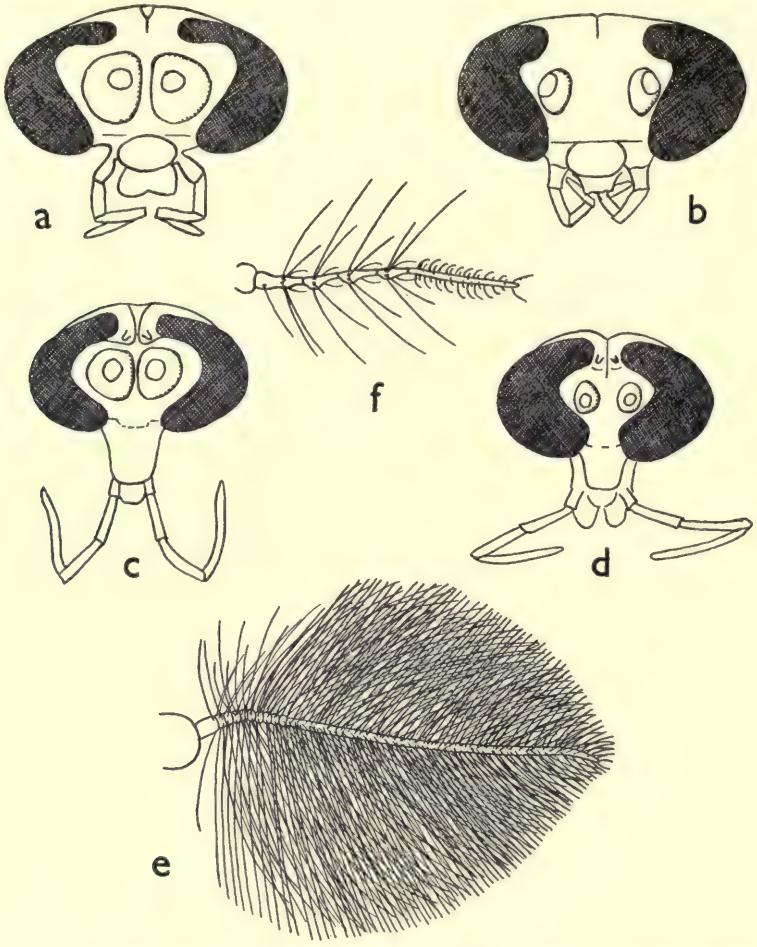

FIG. 1. Heads and antennae of Chironomidae. (*a*) *Clinotanypus niligenus* front view of male head; (*b*) the same of female; (*c*) *Chironomus bellus* Goetgh. front view of male head; (*d*) the same of female; (*e*) *Chironomus bellus* antenna of male; (*f*) the same of female.

those of the female being more or less reniform (Text-figs. 1, *a* and *b*). There is usually some difference between the eyes of the two sexes of a species, those of the female often being larger and with a proportionately shorter and broader dorsal portion (Text-figs. 1, *c* and *d*). The eyes may be pubescent or bare, though this is more often a generic than a specific character.

As in allied families the true basal segment of the antennae is suppressed, the apparent basal one being really the pedicel or second segment. This in both sexes is enlarged (Text-fig. 1), greatly so in the male, and contains Johnston's organ.

The flagellum of the male antenna is strongly plumose and bushy (Text-fig. 1, *e*) except in a few aberrant species and in the subfamily Clunioninae. The maximum number of antennal segments, including the pedicel, is 15 (Tanypodinae). Segments 2–13 are quadrate or transverse, segment 14 is greatly elongate, segment 15 is much shorter and often only indistinctly separated from 14. In the Orthocladiinae and Chironominae the last two segments are fused, giving a total of 14, which in *Chironomus* and allied genera is reduced to 12 by further fusion of the basal segments to the long apical one. The ratio of the length of the last two segments (Tanypodinae) or last one (Chironominae) to the short basal segments taken together is termed the " antennal ratio " or A.R. Although it is variable the A.R. is of some use in specific diagnoses.

The antenna of the female is never plumose, and is shorter, often much shorter than in the male. In the Tanypodinae there may be as many as 15 segments including the pedicel ; the segments are usually quadrate or moniliform, except for the last one which is enlarged and about three times as long as the penultimate. In some Tanypodine genera and species the number may be reduced to as few as 11. In the Orthocladiinae and Chironominae the segmentation of the female antenna is greatly reduced, six being the commonest number of segments (Text-fig. 1, *f*). In several genera there are seven segments and in others only five, fusion having taken place between segments 2 and 3 and between 6 and 7. In the six segmented species, fusion has taken place between segments 2 and 3 and it is sometimes difficult to be certain whether it is complete or not. The segments carry transparent curved sensory bristles sometimes used in classification. Segments 3–5 or 3–6 in those with seven segments are usually fusiform or " flask-shaped," that is, with a basal bulb and an apical neck. Each segment carries 4–6 long hairs in whorls.

The mouthparts are normal in appearance, though they are not large, as the insects rarely feed in the adult state. In some genera (e.g. *Nilodorum*) they are greatly reduced. The palpi are usually long and four segmented ; I have not been able to find good specific characters in the lengths of the segments and there seems to be some variation even in those genera in which they are reduced.

Thorax.

The prothorax is always reduced. In those genera which show it best developed, such as *Chironomus* or some Tanypodinae, it is collar-like and reaches up to the front of the mesonotum where it often has a V-shaped emargination. In the genera of the Chironominae there is a progressive reduction until in *Stenochironomus* and *Microtendipes* the mesonotum projects like a cone over, and almost in front of, the head.

The mesonotum carries three rows of bristles, the central double row being the acrostichal bristles and the sub-lateral ones the dorso-centrals. The central region of the posterior half of the mesonotum is somewhat sunken and flat and I have termed

it the "prescutellar area." The acrostichal bristles sometimes go straight across it, sometimes they part into two rows which run round it (Text-fig. 8, *a*). In some of the Tanypodine genera (e.g. *Tanypus*) there is an oval sharply defined tubercle just anterior to the prescutellar area. The scutellum is semicircular and carries a number of long hairs. Behind the scutellum is the postnotum with the longitudinal furrow characteristic of the family. This furrow is absent in the Podominae (no African species known to me) and greatly reduced in *Anatopynia unicolor* Freeman. There is a membranous area in the pleuron behind the anterior spiracle; the large, lower, ventro-lateral plate is the sternopleuron. The presence of the anepisternal suture is important in the separation of the Clunioninae (Text-fig. 15). This suture normally lies above the sternopleuron, separating it from the anepisternite.

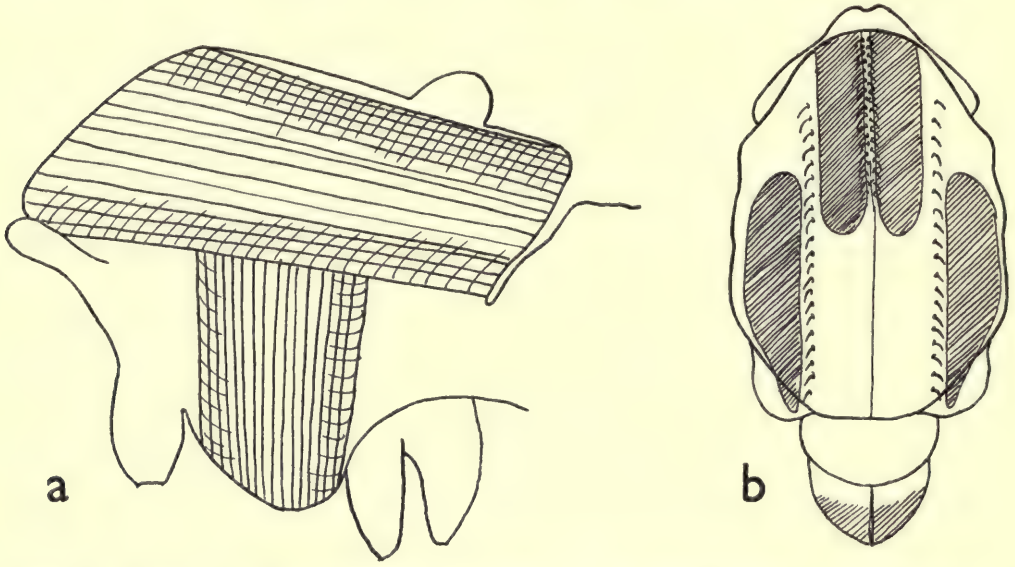

FIG. 2. Thorax of *Chironomus bellus* Goetgh. (*a*) semi-diagrammatic longitudinal section to show main flight muscles; (*b*) dorsal view to show insertions of muscles and rows of bristles.

The thorax has a standard pattern of darker markings which occurs throughout the family. These markings are on the cuticle over the insertions of the large flight muscles, which, as in other insects, are in two paired series, the longitudinal and the vertical.

The longitudinal muscles are in a median pair (Text-fig. 2, *a*) and run from the anterior half of the mesonotum to the postnotum, the posterior wall of which is vertical. These muscles are very deep. The prescutellar area, the scutellum and the basal half of the postnotum are not included in the attachment of these muscles and they are paler in colour. The acrostichal bristles are on the median line between the two longitudinal muscles and sometimes there is a narrow pale line here.

The vertical muscles are lateral to the longitudinal pair and run from the meso-

notum to the sternopleuron (Text-fig. 2, *a*). They are attached laterally to the posterior half of the mesonotum (Text-fig. 2, *b*) and run to the lowest part of the sternopleuron. The dorso-central bristles lie between the vertical and longitudinal muscles.

The darker areas are thus (Text-fig. 2, *b*) a pair (often fused) of anterior median and two postero-lateral mesonotal stripes, the apex of the postnotum and the lower part of the sternopleuron. These areas are nearly always of a different colour from the other parts which do not act as muscle attachments, namely, the shoulders, lines of dorso-central bristles, prescutellar area, scutellum, base of postnotum, and upper parts of pleura. In some very dark species most of the thorax is suffused with a dark colour, but it is usually possible to distinguish the areas of muscle attachment by their slightly darker colour.

The thorax is often pruinose and then the pruinosity is arranged differently on the two types of areas, so that the shoulders, lines of bristles and prescutellar area stand out from the areas of muscle attachment. A change in the direction of the light may reverse the colours, especially when the pruinosity is heavy.

Legs

The legs are long and slender, especially the anterior pair. In the Tanypodinae and Orthocladiinae tibial spurs are present on all the tibiae and the anterior tibia is longer than the basitarsus. In the Chironominae the anterior tibial spur is usually either absent or else reduced in length and placed at the apex of an oval extension of the tibia termed the " scale." In this subfamily the anterior basitarsus is longer than the tibia, often much longer, also the apices of the posterior four tibiae are more complex and carry a pair of combs formed from a series of basally fused spinules. These combs are associated with the spurs, which appear to arise from their inner aspects. The presence or absence of the spurs and the fusion or otherwise of the combs are important in generic diagnosis. The ratio of anterior basitarsus to anterior tibia is useful in specific separation and is termed the " leg ratio " or L.R.

The anterior tarsi of the male may carry a fringe of long hairs, termed a beard. This is usually a specific character, but in the female it is either completely absent or else so reduced as not to be noticeable.

The fifth tarsal segment may carry a pair of pulvilli and an empodium below and between the claws. The development of the pulvilli varies throughout the family ; they are largest in *Chironomus*. In *Polypedilum* and *Pentapedilum* each pulvillus is split longitudinally so that, with the empodium, there are five narrow lobes between the claws.

Wings

The wings of the male are narrower than those of the female, but there is quite often a prominence in the anal lobe, especially in the Orthocladiinae, which is not present in the female. The presence of a fringe of setae on the basal squama is sometimes of taxonomic importance.

The wing membrane may carry both macrotrichia and microtrichia. The presence of the former is of importance generically throughout the family ; the size of the latter is used in the Orthocladiinae to separate some of the more difficult groups, but it is a difficult character to use and necessitates a 1/6 in. objective. In the females the hairs of both types are much better developed than in the males.

Many species have dark markings on the wings. Edwards has given four kinds of markings (1929, *Trans. ent. Soc. Lond.* **77** : 284), but I cannot say that I agree

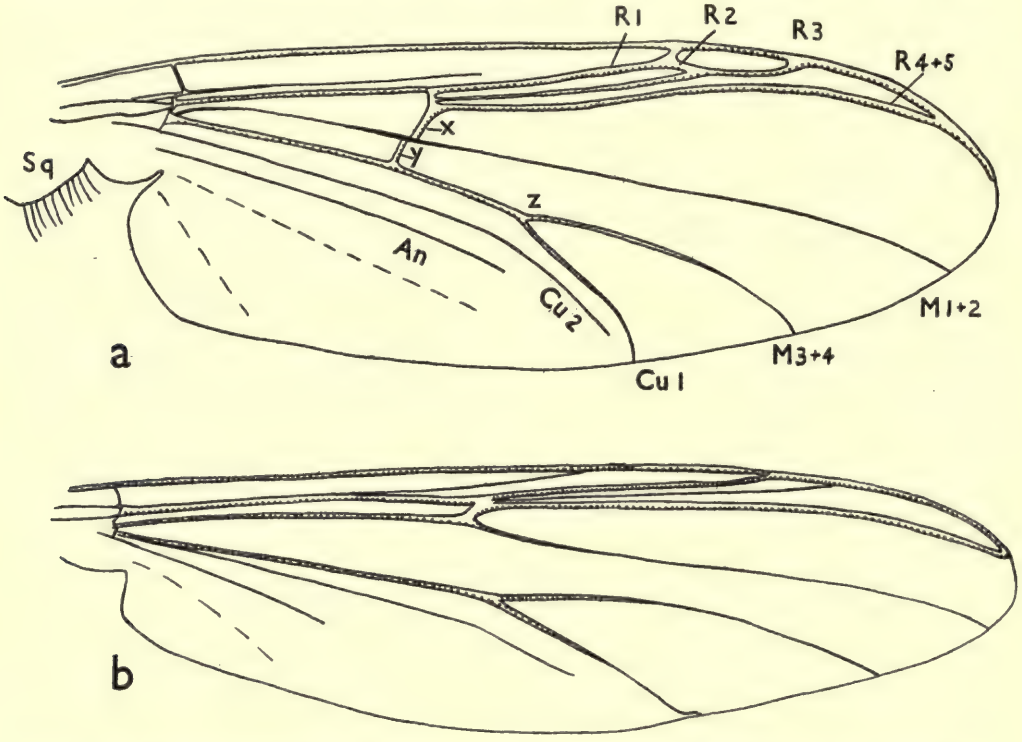

FIG. 3. Wings of Chironomidae. (*a*) *Procladius brevipetiolatus* female ; (*b*) *Chironomus caffrarius* Kieff. female. *x*, r–m cross-vein ; *y*, true base of M_{3+4} ; *z*, posterior fork ; *Sq*, squama and fringe.

completely with his views. In my opinion there appear to be three ways in which the markings are caused :

(1) By patches of dark or dark and light macrotrichia (especially *Anatopynia* and *Pentaneura*).

(2) By areas of greater concentration and darkening of microtrichia (e.g. *Tanypus, Dicrotendipes, Polypedilum*).

(3) By actual staining of the membrane (e.g. *Clinotanypus, Chironomus palustris*).

The dark areas caused by (1) and (2) are usually stained as well, at least slightly. The dark areas caused by the microtrichia are much more definite than those caused by staining alone, which produces a much more suffused effect. Dark

patches of macrotrichia are easily rubbed off, but their position is usually marked by a very light staining of the membrane which can be seen best by reflected daylight.

Examination of the wing markings, however caused, is best carried out by daylight using a binocular microscope, but, as Edwards says, the structural colours due to microtrichia are also visible by transmitted light when the wing is mounted in a liquid medium. This enables photographs to be made easily of this type of marking.

The wing of *Procladius brevipetiolatus* Goetgh. is shown in Text-fig. 3, *a* to illustrate one of the more primitive types of venation. I am adopting the Comstock and Needham system of notation of the veins as modified by Tillyard. Edwards and Goetghebuer did not use Tillyard's modification ; to them the posterior fork was simply the cubital fork composed of Cu_1 and Cu_2. Tillyard has shown, however that this is not so but that the anterior branch is really M_{3+4} which has become joined to Cu. The posterior branch is the true Cu_1, and Cu_2 is reduced to a fold behind Cu_1. In *Procladius* the apparent cross-vein known to Edwards as m-cu is now correctly to be called the base of M_{3+4}.

In the wings of *Pentaneura* (Text-figs. 5, 7, 9) it will be seen that the true m-cu is present as the extreme basal portion of the anterior branch of the posterior fork. In *Coelotanypus* (Text-fig. 12, *a*) M_{3+4} only just touches Cu_1, so that m-cu is obliterated. For convenience in the descriptions I have referred to the M_{3+4}-Cu_1 fork as the " posterior fork " ; the short vein known to Edwards as the " m-cu cross-vein," I now term the " base of M_{3+4}." In the subfamilies Orthocladiinae, Corynoneurinae, Clunioninae and Chironominae the base of M_{3+4} is not developed (Text-fig. 3, *b*).

The veins of the radial field of Diptera have been interpreted by Alexander (1928, *IV Internat. Congr. Ent. Ithaca*, **11** : 700–707), and to some extent the conformation of R_{2+3} in the Tanypodinae agrees with his interpretation. However, the venation is so specialized that I prefer to keep the older notation with R_{2+3} a forked vein in the Tanypodinae and a simple vein in the other subfamilies.

The vein M_{1+2} is simple in all Chironomidae and is connected to the radial sector by the cross-vein r-m. There is very often a dark spot or cloud over the cross-vein.

The condition of the costa, whether or not it is extended or " produced " beyond the apex of R_{4+5} is important for specific and generic diagnosis.

Abdomen

Except for the male hypopygium there are few features of systematic importance in the structure of the abdomen, although the arrangement of spots and bands is often helpful, especially in the male. There is sexual difference in the appearance of the abdomen ; in the male it is slender, often with well developed markings ; in the female it is stouter and darker and the markings are much less well developed.

The male hypopygium (Text-fig. 4) consists essentially of a pair of two segmented claspers, the basal segment being the coxite and the apical the style. In some of the Tanypodinae there is very little else than this, except that the style has an apical spine and the coxite a few hairs on the inner surface. Internally, associated with the junction of IXth segment and coxite there are a pair of struts which fuse in the mid-line and another pair lying more or less transversely (Text-fig. 4, *a*, *c*) ; these struts show greater development in the Corynoneurinae.

In all the subfamilies except the Chironominae, the styles can bend forwards and lie against the inner aspects of the coxites (Text-fig. 4, *a*) ; they carry an apical spine and sometimes a longitudinal flange. In the Chironominae (Text-fig. 4, *c*, *d*) the styles project rigidly backwards and do not carry apical spines, but there is often a row of long setae internally near the apex.

The coxites carry lobes or appendages on their inner aspects, one or two in the Orthocladiinae (Text-fig. 4, *a*), as many as four in some genera of the Chironominae. Whether the lobes of the Orthocladiinae are homologous with the appendages of the Chironominae is not clear, but they arise in more or less the same positions. In the Chironominae there is an upper, often hook-like, appendage 1 and a lower, usually larger, more hairy, appendage 2 (Text-fig. 4, *c*, *d*) : each may have a subsidiary appendage termed 1a and 2a respectively (especially in *Tanytarsus*).

The ninth tergite usually carries an " anal point " (Text-fig. 4) its length, hairiness and position being important. The anal point is not developed in the Tanypodinae and it is absent spasmodically throughout the family. The ninth sternite is narrow and band-like. The tenth segment is largely membraneous, but occupies quite a large area in the Orthocladiinae (Text-fig. 4, *a*).

In *Pentaneura* subgenus *Ablabesmyia* there are aedeagal structures (Text-fig. 10) between the coxites. These are erectile and can be only studied properly when they are everted, a condition not often seen. I have had no success with artificially everting them after death. This is a pity because there appear to be good specific differences in these structures.

The spermathecae have hardly been mentioned in the literature and Edwards (1937, *Ann. Mag. nat. Hist.* (10) **20**:141) casts doubt on their existence as sclerotised structures, at any rate in Orthocladiine genera other than *Abiskomyia* and *Symbiocladius*. I have taken this opportunity of examining the spermathecae of representatives of the following genera: *Pentaneura, Procladius, Podonomus, Protanypus, Diamesa, Metriocnemus, Cardiocladius, Cricotopus, Abiskomyia, Psectrocladius, Orthocladius, Pseudochironomus, Chironomus, Cryptochironomus,* and *Polypedilum.*

In the Tanypodine genera and in *Protanypus* the spermathecae are three in number, spherical or oval and well sclerotised; in a new Orthocladiine genus to be described later there are three bell-shaped ones. In the other Diamesine, Podomine and Orthocladiine genera except *Cardiocladius*, the spermathecae are two in number, spherical and sclerotised. In the Chironominae and in *Cardiocladius* they are again two in number and spherical, but here they are colourless and quite unsclerotised. It seems then that these organs are subject to a progressive reduction throughout the family, although a much more extensive study is necessary to form any detailed conclusions.

VARIATION AND DIFFERENCES BETWEEN THE SEXES

There is a good deal of variation within a species in colour, in the leg and antennal ratios and in hairiness. The mesonotal stripes are the parts most noticeably affected by colour variation, both in shade and also in the degree of fusion in dark species.

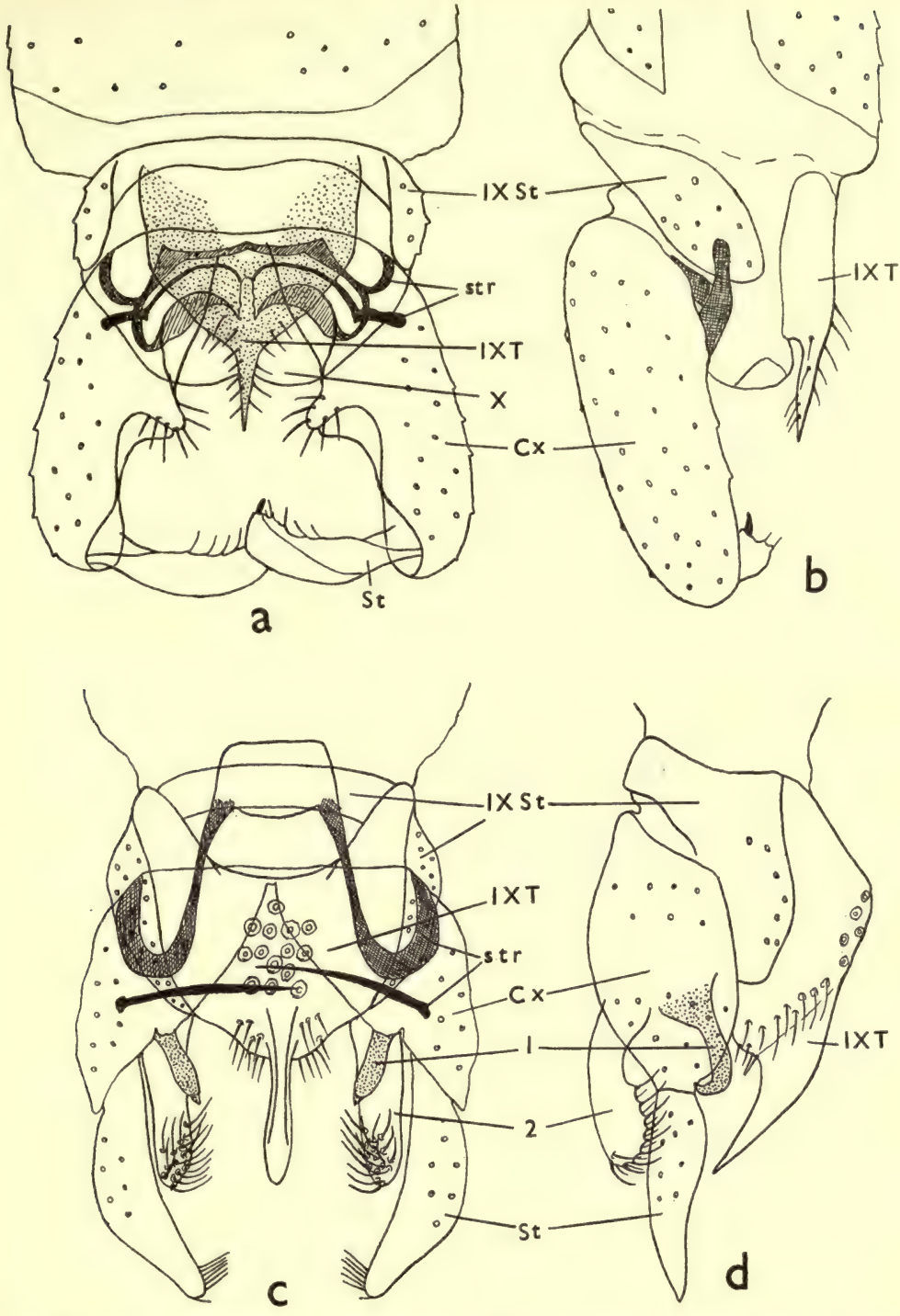

FIG. 4. Male hypopygia of Chironomidae. (*a*) *Orthocladius bergensis* Freeman in dorsal aspect; (*b*) the same in lateral aspect; (*c*) *Chironomus caffrarius* Kieffer in dorsal aspect; (*d*) the same in lateral aspect. *Cx*, coxite; *St*, style; *str*, struts; 1, coxite appendage 1; 2, coxite appendage 2; *IXSt*, ninth sternite; *IXT*, ninth tergite and anal point; *X*, tenth segment.

The wing markings, when present, are also liable to vary. Townes (1945, *Amer. Midl. Nat.* **34**: 6) states that specimens developing at lower temperatures have more dark pigment than those developing at a higher temperature. The African species seem to agree with this.

There is considerable difference in appearance between the two sexes. The greatest differences are in the antennae and the abdomen. In the male the antennae are almost always plumed and the ultimate or penultimate segment very long; also the pedicel is greatly enlarged. In the female the antennae are reduced in length and segmentation, except in the Tanypodinae and the plumes are not developed; the pedicel is smaller than in the male. On the other hand, the eyes of the female tend to be bulkier than in the male. The male abdomen is slender, with the hypopygium at the end, and it often carries markings. In the female the abdomen is bulkier, lacks the hypopygium and tends to be unicolorous. Other differences lie in the wider female wings and absence in that sex of a tarsal beard even when present in the male. However, when macrotrichia are present on the wings, they are much better developed in the female.

Thoracic and leg structure and pattern, wing venation and pattern are usually rather similar in both sexes. The colour pattern may be more clearly defined in the female, the darker markings being more definite.

Intersexes caused by parasitism by a Nematode worm of the family Mermithidae are often found. Rempel (1940, *Journ. Exp. Biol.* **84**: 261–87) has dealt with the subject in detail. He finds that it is the female larvae which are attacked, males are seldom infested and if they are, do not become intersexes. The Nematode larva feeds on the developing ovaries and gluten gland which induces in the host the development of male sexual characters, resulting in an intersex.

A typical intersex looks like a female with normal male hypopygium and there is a varying amount of male internal structure regenerated. The insect behaves as a female, mating with a male and making " egg laying " flights over the water.

The genus *Gillotia* Kieffer was described from such a specimen. A normal male is seen to belong to the genus *Cryptochironomus*.

KEY TO SUBFAMILIES OF CHIRONOMIDAE

1. Base of M_{3+4} present 2
   Base of M_{3+4} absent 4
2. Postnotum lacking median furrow; R_{2+3} completely absent, although R_1 and R_{4+5} are well separated . . . . . PODOMINAE
   Postnotal furrow well developed except in one species and in this R_{2+3} is well developed; R_{2+3} present 3
3. R_{2+3} forked (e.g. Text-fig. 5) (in some small species of *Pentaneura* R_{2+3} is crowded out by close approximation of R_1 and R_{4+5}, but in these species wings very hairy) TANYPODINAE
   R_{2+3} simple (Pl. I, fig. m) and always distinct, wings usually bare . . DIAMESINAE
4. L.R. less than 1; front tibia with spur; tibial combs not composed of short basally fused spinules; male styles folded inwards 5
   L.R. nearly always more than 1; front tibial spur reduced, except in *Pseudochionomus* (no African species described); tibial combs composed of short basally fused spinules in nearly all genera; male styles always directed rigidly backwards CHIRONOMINAE

5. R_{4+5} completely fused with the thickened costa to form a " clavus " and with a false vein running close to anterior margin on outer half of wing . . CORYNONEURINAE
   R_{4+5} not fused with the thickened costa 6
6. Pronotum scarcely divided ; anepisternal suture well developed (Text-fig. 15) ; male antenna normally plumose . . . . . ORTHOCLADIINAE
   Pronotal lobes widely separated ; anepisternal suture obsolete (Text-fig. 15) ; male antenna not plumose . . . . . CLUNIONINAE

Subfamily *PODOMINAE*

There are no species of this subfamily either recorded or known to me from Africa south of the Sahara. Species are recorded from or known to occur in the Holarctic Region, Chilean Sub-region, South Georgia and New Zealand and it is quite likely that some may be found in South Africa or in the mountainous parts of Central and East Africa. The subfamily is included here for the sake of completeness.

The Podominae can be separated from the Tanypodinae because (1) R_{2+3} is completely absent even though R_1 and R_{4+5} are well separated ; (2) the postnotum is short and evenly rounded and has no trace of the median furrow ; (3) at rest the wings are superposed over the back as in the Ceratopogonidae.

KEY TO GENERA OF PODOMINAE

1. Costa ending at tip of R_{4+5} . . . . . *Parochlus* Enderlein
   Costa produced well beyond tip of R_{4+5} 2
2. Base of M_{3+4} basal to posterior fork 3
   Base of M_{3+4} distal to or opposite posterior fork 4
3. Pulvilli large, eyes pubescent . . . . . *Trichotanypus* Kieffer
   Pulvilli absent, eyes bare . . . . . *Boreochlus* Edwards
4. Hind tibia without a definite comb on the inner side at tip, both spurs long ; R_1 long and slender in both sexes ; female antenna with 15 segments *Lasiodiamesa* Kieffer
   Hind tibial comb present, one spur short ; R_1 more or less swollen apically in the female ; female antenna with 8–12 segments . . . . *Podonomus* Philippi

Subfamily *TANYPODINAE*

The Tanypodinae differ from the other subfamilies by the retention of vein R_2, though in some small species of *Pentaneura* the whole vein R_{2+3} may become crowded out by the close approximation of veins R_1 and R_{4+5}. Other primitive characters lie in the presence of the base of M_{3+4} and in the segmentation of the antennae. In the male there are 15 antennal segments, the fifteenth being formed at the apex of the greatly elongated fourteenth. In the female the maximum number of 15 segments is developed in *Anatopynia* and some species of *Tanypus*, the lowest number for the African fauna is 11 in *Pentaneura pictipes* Kieffer. The male hypopygium usually has no basal coxite lobes or appendages, although in some species of *Pentaneura* aedeagal appendages are present. The larvae are carnivorous, feeding mostly on other Chironomid larvae.

The subfamily is well represented in Africa south of the Sahara, most genera and species groups being present. The species of *Coelotanypus* and *Clinotanypus* suggest that these two genera are only doubtfully distinct, and there is a tendency for

some of the other genera to run together. There are no new genera in the material at my disposal and practically all the species fit into species groups known from the Palaearctic Region. The species of *Anatopynia* seem to be more or less confined to the mountainous regions and to the Cape, otherwise the species of the subfamily are fairly well distributed over the Region.

KEY TO GENERA OF TANYPODINAE

1. Fourth segment of tarsus cordiform ; wing membrane without macrotrichia . . 2
   All tarsal segments cylindrical ; macrotrichia present on wing membrane, except in *Procladius* subg. *Psilotanypus* 3
2. Posterior fork stalked, mesonotum with central oval tubercle in one species only *Clinotanypus* Kieffer
   Posterior fork sessile (i.e. opposite free base of M_{3+4}) ; mesonotum always with central oval tubercle . . . . . *Coelotanypus* Kieffer
3. Posterior fork stalked 4
   Posterior fork basal to free base of M_{3+4} 5
4. Central mesonotal tubercle present, stem of posterior fork less than one third as long as Cu_1 . . . . . *Tanypus* Meigen
   Tubercle absent, stem of fork about half as long as Cu_1 . . . . *Procladius* Skuse
5. Female antennae with 11–13 segments ; costa normally not produced, smaller species *Pentaneura* Philippi
   Female antennae with 15 segments ; costa always distinctly produced beyond the apex of R_{4+5} . . . . . *Anatopynia* Johannsen

Genus ***PENTANEURA*** Philippi

Pentaneura Philippi, 1865, *Verh. Zool.-bot. Ges. Wien.* **15**, 629 ; Edwards, 1929, *Trans. ent. Soc. Lond.* **77** : 287 ; Johannsen, 1946, *Journ. New York ent. Soc.* **54** : 267–89 ; Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22** : 127.

Isoplastus Skuse, 1889, *Proc. Linn. Soc. N.S. Wales* (2) **4** : 279 (nec *Isoplastus* Horn, 1880, *Trans. Amer. ent. Soc.* **8** : 277, 295—Coleoptera) ; Kieffer, 1911, *Trans. Linn. Soc. Lond.* **14** : 364.

Ablabesmyia Johannsen, 1905, *Bul. N. Y. St. Mus.* **86** : 135 ; Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 356.

Nilotanypus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 191.

Tanypus (Meigen) Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 192.

Psectrotanypus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 202 (nec Kieffer, 1909, *Bull. Soc. Metz* **26** : 42).

As stated in my 1953 paper I am following Edwards in the use of *Pentaneura* for this genus. The following definition is taken from Edwards :

Wings densely hairy. Costa not or only very indistinctly produced ; R_2 normally present ; base of M_{3+4} placed immediately beyond the posterior fork. Antennae of female with 11–13 segments. Pronotum more reduced than in other genera of the subfamily. No tarsal spurs. Pulvilli usually absent.

Although this definition fits most species, one or two of the African species have the costa produced and in some the prothorax is not much smaller than in *Anatopynia*. This makes the two genera really only separable on the number of segments in the female antennae. However, it is desirable to keep the two genera separate because the larvae and pupae of *Pentaneura* differ from those of the rest of the subfamily, whilst those of *Anatopynia* tend to resemble the rest of the subfamily.

Edwards divided the British species of *Pentaneura* into six groups and Johannsen has done the same with the North American species. Some of these groups seem to be very artificial when applied to the African fauna. I have found that the African species fall easily into two groups, which may well prove later to be of full generic status, though I am leaving them as subgenera until both sexes of *P. annulator* Goetgh. can be examined, as this species is to some extent intermediate. In all species of both groups the wings are densely clothed with macrotrichia and there is often a pattern formed by areas of light and dark macrotrichia.

KEY TO SUBGENERA OF *Pentaneura*

Tibiae without black rings, at the most there are brown markings above and below the knees ; prescutellar area not well defined, acrostichal bristles running across it ; male hypopygium usually without basal aedeagal structures, spine of style apical
Pentaneura Philippi

Tibiae with three or four well defined black rings (Text-fig. 8) ; prescutellar area sharply defined, more or less circular, acrostichal bristles diverging around it ; male hypopygium always with complex aedeagal structures, spine of style subapical (Text-fig. 10)
Ablabesmyia Johannsen (*Isoplastus* Skuse)

Pentaneura PHILIPPI SUBGENUS *Pentaneura* SENSU STRICTO

Pentaneura Philippi, 1865 ; Edwards, 1929 (Groups B–F) ; Johannsen, 1946 (Groups B–F) ; Freeman, 1953 (in part).
Isoplastus Kieffer, 1911.
Ablabesmyia Johannsen, 1905 (in part) ; Goetghebuer, 1935 (in part).
Nilotanypus Kieffer, 1923.
Psectrotanypus Kieffer, 1923.

This subgenus includes *Nilotanypus* because of the connecting Palaearctic species *P. longipalpis* Goetghebuer. This is unfortunate because typical *Nilotanypus* species are easily recognized by their pubescent eyes and retracted costa, and might otherwise be separated off as a distinct genus.

Most of the species have simple coxites in the male, but in a few species there are spiny lobes carried basally on the coxites ; none of the species known to me has the complex structures found in the subgenus *Ablabesmyia*. The other characters of the subgenus are given in the key above. All the small, pallid, unicolorous species belong here, and there are no doubt many more species to be discovered in Africa. Some of the species are much larger and markings on the wings are common. It is of interest to note that Kieffer only described one species belonging to this subgenus against more than a dozen belonging to the other subgenus, although the total number of species in *Pentaneura* is much greater than in *Ablabesmyia*.

KEY TO AFRICAN SPECIES OF *Pentaneura* SENS. STR.

1. Tarsi with wide black rings in middle of basitarsus and at base of second segment, segments 3–5 black . . . . . *annulator* Goetghebuer
   Tarsi without rings 2
2. Small species (wing length 0·75–1·4 mm.) with retracted costa (Text-fig. 7, *d*) and often hairy eyes 3
   Costa longer, ending beyond level of M_{3+4}, eyes always bare 5

3. Eyes bare . . . . . *minimus* Kieffer and *micra* sp. n.
   Eyes hairy 4
4. Macrotrichia covering wing densely . . . . . *comata* Freeman
   Macrotrichia confined to apex of wing in male and sparsely arranged in female *remotissima* Kieffer
5. Legs darkened at knees or at any rate femora with subapical brown ring, wings with markings 6
   Legs quite plain 9
6. Wing membrane deeply stained beneath spot in middle of cell R_5 (Text-fig. 5, c) *tinctoria* sp. n.
   Wing membrane only very lightly stained beneath the spots 7
7. Small species (wing length 1·3 mm.) with black knees, wing markings as in Text-fig. 5, *d* . . . . . *teesdalei* sp. n.
   Larger species (wing length 1·8–3·8 mm.), femora with subapical ring 8
8. Wing pattern as in Text-fig. 5, *a*, with a broad fascia; male hypopygial basal appendages with lateral basal processes (Text-fig. 6, *a*) . . . . *cygnus* Kieffer
   Wing pattern as in Text-fig. 5, *b*, fascia narrower, obvious apical markings present; male hypopygial appendages simple (Text-fig. 6, *b*) . . . *trifascia* Freeman
9. Wings with dark markings 10
   Wings quite plain, unmarked even at the cross-vein 13
10. Wing markings confined to a small cloud over cross-vein . *rutshuruiensis* Goetghebuer
    Wing markings more extensive 11
11. Wings with faint transverse grey band and grey at apex . *interrupta* Goetghebuer
    Wings with markings different from these 12
12. Wings darker with pale markings (Text-fig. 5, *e*, *f*) 12a
    Wings light with dark markings (Text-fig. 5, *g*) . . . . *octomaculata* Freeman
12a. Cell M_1 with only one pale area . . . . . *nigromarmorata* Goetghebuer
    Cell M_1 with two pale areas . . . . . *septemguttata* sp. n.
13. Wing length over 3·0 mm. 14
    Wing length less than 3·0 mm. 15
14. R_{4+5} ending before level of M_{1+2} (Text-fig. 7, *a*) . . . . . *edwardsi* sp. n.
    R_{4+5} ending beyond level of M_{1+2} (Text-fig. 7, *b*) . . . . . *longinervis* sp. n.
15. Hairs on posterior tibiae of male very long, sometimes one third length of tibia; shoulders strongly pruinose . . . . . *hirsuta* sp. n.
    Hairs on posterior tibiae of male normal; shoulders not strongly pruinose . . 16
16. Wing hairs dark and dense; palpi of female as long as antennae . *palpalis* Goetghebuer
    Wing hairs light brown, palpi not noticeably longer than usual 17
17. Costa strongly produced 18
    Costa not produced 19
18. Yellowish species, though thorax may have reddish stripes *pallidissima* Kieffer and *uniformis* Goetghebuer
    Species with dark brown pruinose thorax, abdomen also dark . *aurantiaca* Kieffer
19. Middle and posterior tibiae one and a half times length of femora; segment 4 of male abdomen mainly pale; wing hairs dense . . . . . *longipes* sp. n.
    Middle tibiae hardly longer than femora; segment 4 of male abdomen with pale apical band only; wing hairs normal . . . . . *meilloni* sp. n.

Pentaneura (Pentaneura) annulator Goetghebuer

Ablabesmyia annulator Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 357.

I have seen no specimens of this species, but it should be easily recognizable because of the presence of black rings on at least the anterior tarsi, and at the apices of the tibiae—the other tarsi are broken in the only specimen known; the wings have

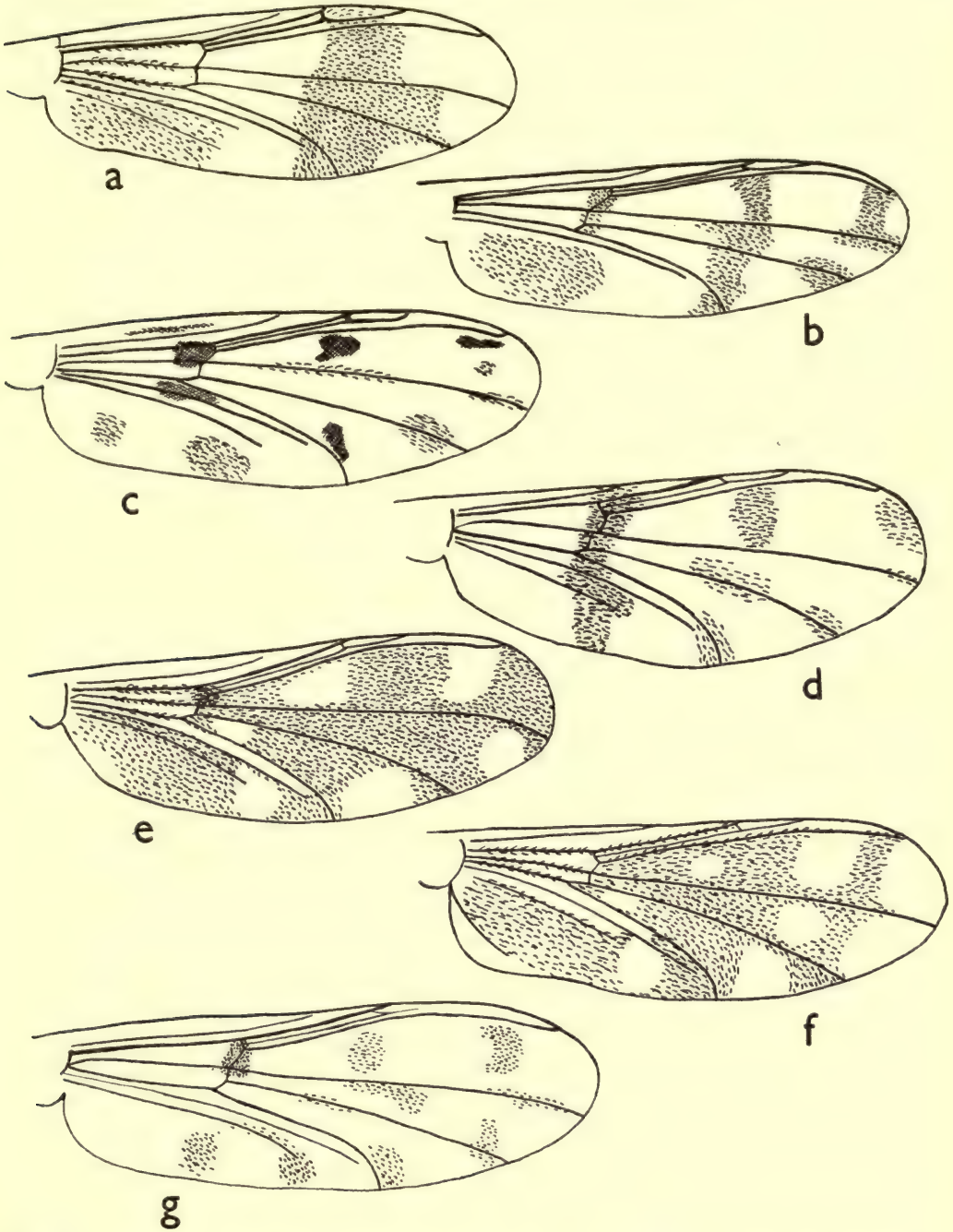

FIG. 5. Wings of *Pentaneura* sens. str., females, only areas of dark macrotrichia shown. (*a*) *P. cygnus*; (*b*) *P. trifascia*; (*c*) *P. tinctoria*; (*d*) *P. teesdalei*; (*e*) *P. nigromarmorata*; (*f*) *P. septemguttata*; (*g*) *P. octomaculata*.

nebulous spots, probably white on a dark background. It would be interesting to study a male and the prescutellar area to see whether it truly belongs to this subgenus. The following description is translated from the original description.

Female. Length 2 mm.

Mesonotum yellowish grey with abundant yellowish pubescence, scutellum yellow, sternopleuron brown black, postnotum black, abdomen black with yellow pubescence; femora grey, extremity whitish; tibiae white with the extremity black; anterior basitarsus white with a central black ring (the figure also shows a narrow black apex); second tarsal segment white, basally black; segments 3–5 black; halteres greyish. Antennae 12-segmented, 3–11 ovoid, the last as long as the two preceding together. Anterior tibiae hardly longer than the basitarsus, posterior tarsi broken, posterior legs with long hairs. Wings very hairy, macrotrichia black, with nebulous spots, of which one large spot is in the second half of the wing in cells R_5, M_{1+2} and M_{3+4}, other spots are in the basal half; r-m black; costa not produced.

Type locality, BELGIAN CONGO: Escarpement Kabasha, Chambi.

Pentaneura (Pentaneura) cygnus Kieffer

Psectrotanypus cygnus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92**: 203.

This species is readily recognizable by the structure of the male hypopygium, which agrees quite closely with Kieffer's figure. This and the following species belong to a small group which includes some Palaearctic and Nearctic species (e.g. *pallidula* Meigen and *flavifrons* Johannsen) and which is characterized by the presence of paired hairy or spiny processes between the coxites and by the stout curved styles, slightly swollen near the apex. In *cygnus* the hairy processes are produced laterally at their bases; in addition it is a much paler insect than *trifascia* the thoracic background is whiter and the wing markings are different.

Male. Wing length 1·8–2·2 mm.

Head and mouthparts pale yellow, antennae and face brown; A.R. about 1·5. *Thorax* with whitish background especially on shoulders and prescutellar area; mesonotal stripes, postnotum and sternopleuron yellowish brown, stripes more or less fused, hairs pale. *Legs* quite pale, femora slightly darkened subapically, tibial hairs moderately long. *Wings* with pattern of dark macrotrichia as shown in Text-fig. 5, *a*; in some specimens there is an additional area of dark hairs at the apex of cell R_5. Halteres white. *Abdomen* white, segments 2–5 with brown basal rings and a brown median area in the basal half which is not always well marked, segments 6–8 with only the apices white, hypopygium white. Hypopygial structure as in Text-fig. 6, *a*, basal spiny processes produced laterally at their bases, style rather swollen near the apex.

Female. Very similar to male in colour and pattern; abdomen whitish, each segment brown at the base.

I have seen no type material; type locality, ANGLO-EGYPTIAN SUDAN: Shambe.

DISTRIBUTION. ANGLO-EGYPTIAN SUDAN: 1 ♂, Khartoum, x.1951 and 4 ♂,

Wad Medani, ii.1952 (*D. J. Lewis*); 5♂, 12 ♀, at light on Nile steamer between Melut and Shambe, 17–22.xi.53 (*E. T. M. Reid*). GOLD COAST: 1 ♀, Kpong, iv.1922 (*J. W. S. Macfie*); 3 ♂, 3 ♀, Red Volta, Bolgatanga, xi.54 (*G. Crisp*). KENYA: 1 ♂ in aeroplane flying from Juba-Kisumu, 3.vi.35 (*C. B. Symes*). BELGIAN CONGO: 2 ♂, 5 ♀, Elisabethville, xii.38 (*H. Brédo*). NATAL: 1 ♂, Tugela River, Colenso, 14–30.ix.53 (*A. D. Harrison*).

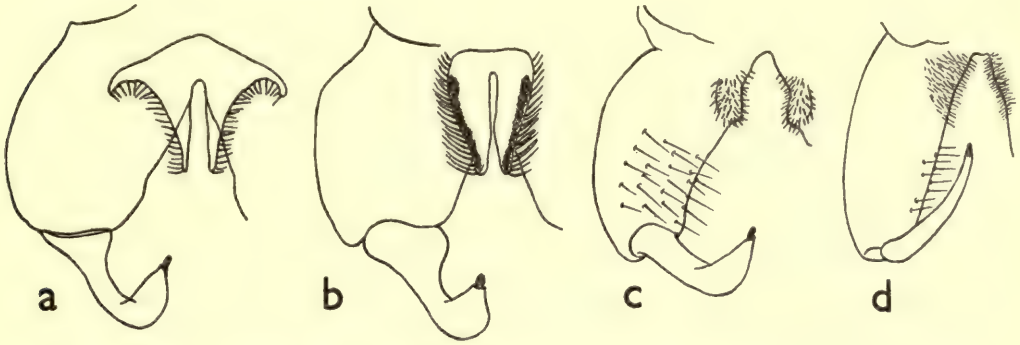

FIG. 6. Male hypopygia of *Pentaneura* sens. str. (*a*) *P. cygnus*; (*b*) *P. trifascia*; (*c*) *P. tinctoria*; (*d*) *P. nigromarmorata*.

Pentaneura (Pentaneura) trifascia Freeman

Pentaneura trifascia Freeman, 1954, *Proc. R. ent. Soc. Lond.* (B) **23**: 172.

Allied to *P. cygnus* but readily distinguished by the different wing pattern and structure of the basal appendages of the male hypopygium; the size is larger and the thorax often has a cross-banded appearance.

Male. Wing length 2·6–3·8 mm.

Head, mouthparts and antennae brown, A.R. about 1·3–1·5. *Thorax* largely brownish, mesonotal stripes separate, shoulders and prescutellar area yellowish and pruinose; posterior half of median stripe and anterior halves of lateral stripes often darker, giving thorax a cross-banded appearance; scutellum pale. *Legs* brown or pale, unmarked except for a subapical dark ring on the femora. *Wings* with dark macrotrichia arranged as shown in text-fig. 5, *b*, more or less in three fasciae; spot in centre of cell R_5 rather darker than others, venation as shown. Halteres yellow. *Abdomen* in dark specimens mainly blackish, segment 1 pale, segments 2–5 with apical half or third pale; in paler specimens segments 1–5 mainly pale; hypopygium either entirely black or partially yellow; structure (Text-fig. 6, *b*) very similar to *P. cygnus*, but basal coxite structures not produced laterally and each has a thickening rod.

Female. Resembles male in colour and pattern except for abdomen which is dark with all segments paler apically; antennae 12-segmented.

The holotype female is in the British Museum. Type locality CAPE PROVINCE, Tulbagh Barrage.

DISTRIBUTION. ABYSSINIA: 3 ♀, Dessie, 28.xii.35 (*J. W. S. Macfie*). KENYA: 1 ♀, Kabete, xi.1913 (*T. J. Anderson*); 1 ♂, Mt. Elgon, Heath Zone, 10,500–11,500 ft. ii.1935 (*F. W. Edwards*). BELGIAN CONGO: 1 ♂, Elisabethville, xii.38 (*H. J. Brédo*). NYASALAND: 1 ♂, Blantyre, 21.v.14 (*J. B. Davey*); 1 ♀, Zomba, August (*H. S. Stannus*). NATAL: 1 ♂, Van Reenen, Drakensburg, xii.1926 (*R. E. Turner*); 7 ♂, 7 ♀, Giant's Castle Camp, Drakensburg, 18–30.ix.53 (*A. D. Harrison*). CAPE PROVINCE: 2 ♀, Tulbagh Barrage, 17.xi.53 (*K. M. F. Scott*). S. W. AFRICA: 17 ♀, Kaokoveldt, Ohopoho, 4.vi.51 (*Swedish S. Afr. Exp.*).

Pentaneura (Pentaneura) tinctoria sp. n.

Easily distinguished from the other species with slight darkening at the knees because the wing membrane is deeply stained beneath some of the spots; male styles not unlike those of *P. cygnus* but basal coxite appendages absent.

Male. Wing length 2·5 mm.

Head brownish yellow, mouthparts darker brown, antennae pale, scape dark, A.R. 1·1. *Thorax* brown, shoulders and scutellum yellow, lines of bristles and prescutellar area pruinose. *Legs* pale brown or yellowish, femora and tibiae slightly darkened above and below the knees, L.R. about 1·5. *Wings* (Text-fig. 5, *c* of female) with spots of black macrotrichia as shown, but with some of the spots, particularly the one in the middle of cell R_5, the membrane is deeply stained so that the spot is readily visible even if the macrotrichia are abraded. Halteres white. *Abdomen* with segments 1–5 whitish pruinose, each with a darker basal band which is progressively wider until it occupies about half of segment 5; remainder of abdomen dark. Hypopygium (Text-fig. 6, *c*) with styles not unlike those of *cygnus*, coxites with a small basal lobe and hair patch but without large appendages.

Female. Quite similar to male in colour and pattern, except for abdomen which is brown, each segment pruinose on apical half.

Holotype, male, in British Museum.

DISTRIBUTION. NATAL: holotype male and 2 ♀ paratypes, Mooi River, Rosetta, 30.ix.53 (*A. D. Harrison*).

Pentaneura (Pentaneura) teesdalei sp. n.

A very small pale species, readily distinguished from all other African species known to me by the wing pattern, dark knees, and abdominal pattern.

Male. Wing length 1·3 mm.

Head, mouthparts, antennae pale yellow, scape brown, A.R. 1·2. *Thorax* pale yellow with brown stripes, postnotum and sternopleuron. *Legs* very pale, narrowly blackened at the knees, hairs moderately developed. *Wings* (Text-fig. 5, *d*) with macrotrichia arranged as shown. Halteres white. *Abdomen* white with black bands occupying basal halves of segments 3 and 4, segment 2 very narrowly dark at the base, 6 and 7 more or less darkened. Hypopygium very similar to that of *P. nigromarmorata* (Text-fig. 6, *d*).

Female. Similar to male in colour except for abdomen which is pale with a dark mark on each segment; antennae 12-segmented.

Holotype male in British Museum.

DISTRIBUTION. KENYA : holotype male and 12 ♂, 13 ♀ paratypes, Kitui, 29.vi.53 (*C. T. Teesdale*).

Pentaneura (Pentaneura) rutshuruiensis Goetghebuer

Ablabesmyia rutshuruiensis Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 362.

A small pale insect, male with narrow dark markings on abdomen ; a small cloud over cross-vein distinguishes it from other African species.

Male. Wing length 1·8 mm.

Head yellowish, pedicel brown, A.R. 1·0. *Thorax* yellowish brown, mesonotal stripes brown, central one divided, intervening areas pruinose, bristles brown. *Legs* translucent yellowish brown, L.R. 0·7, posterior tibia one and a half times as long as femur, tibia clothed with long hairs, pulvilli absent. *Wings* hyaline, cross-vein darkened and surrounded by a small cloud ; membrane clothed fairly densely and evenly with dark macrotrichia which are absent from upper basal cell and base of cell R_5, venation as in *P. meilloni*, costa reaching to just beyond level of M_{3+4}. Halteres white. *Abdomen* white, segment 1 with a dark mark each side, segments 2–7 with dark rings occupying more or less the basal third, segment 8 pale, hypopygium dark and simple, hairs pale.

Female. Very similar to male, abdomen unicolorous yellowish brown ; antennae 12-segmented.

Holotype female in Musée Royal du Congo Belge, paratype in British Museum. Type locality, BELGIAN CONGO, Rutshuru.

DISTRIBUTION. BELGIAN CONGO : 4 ♂, 2 ♀, Rutshuru (*de Wulf and de Witte*). CAPE PROVINCE : 5 ♂, 1 ♀, Berg River, French Hoek, 26.xi.53 (*K. M. F. Scott*).

Pentaneura (Pentaneura) nigromarmorata Goetghebuer

Ablabesmyia nigromarmorata Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 361.

Easily recognized in the female sex by the five well marked pale areas on the otherwise dark wings ; in the male there is less definition of the pale areas. General body colour brown, legs unmarked.

Male. Wing length 2 mm.

Head and antennae brown, mouthparts slightly darker, A.R. 1·3. *Thorax* brown with silvery pruinosity on shoulders, between stripes and around prescutellar area ; scutellum yellow, bristles brown. *Legs* yellowish brown, without markings, posterior legs with well developed but not particularly long hairs. *Wings* with pattern basically similar to that of female (Text-fig. 5, *e*) but much less strongly developed ; membrane mainly covered with dark macrotrichia, but with five or six areas of pale macrotrichia rather larger than shown for the female and there is an additional one at the apex. Halteres yellow. *Abdomen* brown, segments 2–5 with apical half pale ; hypopygium simple (Text-fig. 6, *d*).

Female. Colour of head, thorax and legs similar to male, abdomen brown,

segments paler apically. Wings with dark macrotrichia over most of their surface and with rather distinctive areas of pale macrotrichia as shown in Text-fig. 5, *e*.

I have not seen the holotype, which is a female in the Musée Royal du Congo Belge. Type locality, BELGIAN CONGO, Rutshuru.

DISTRIBUTION. BELGIAN CONGO: Rutshuru. TRANSVAAL: 1 ♀, Johannesburg, v.1930 (*B. de Meillon*). NATAL: 5 ♂, Tugela River, 17.30.ix.53 (*A. D. Harrison*). CAPE PROVINCE: 1 ♂, Berg River, Hermon (*K. M. F. Scott*); 2 ♂, 1 ♀, Kokstad, 21–22.iii.53 (*G. H. Satchell*). S. W. AFRICA: 2 ♂, Kaokoveldt, Ohopoho, 4.vi.51 (*Swedish S. Afr. Exp.*).

Pentaneura (Pentaneura) septemguttata sp. n.

A distinctive light brown species, not unlike *P. nigromarmorata* but easily distinguished by the additional pale spots on the wings and by the presence of two transverse pruinose bands on the thorax.

Male. Wing length 2·2 mm.

Head brown, mouthparts paler, antennae and plumes brown, A.R. 1·75. *Thorax* light brown, with pruinosity as two bands, one at the level of the shoulders, the other just anterior to wing base; prothorax and pleura also pruinose, postnotum dark apically. *Legs* pale yellowish, unmarked, L.R. 0·7. *Wings* (Text-fig. 5, *f* of female) mostly covered with dark macrotrichia, but with seven well marked areas of pale hairs as shown, the two spots near the apex of cell M_1 are especially characteristic. Halteres pale. *Abdomen* yellowish, segments 3, 4, 6, 7, 8 with a darker spot bearing dark hairs; hypopygium simple.

Female. Similar to male.

Holotype male and paratype 1 female, NYASALAND: Ruo, 6.iv.16 (*R. C. Wood*) both in British Museum.

Pentaneura (Pentaneura) octomaculata Freeman

Pentaneura octomaculata Freeman, 1954, *Proc. R. ent. Soc. Lond.* (B) **23**: 172.

Very similar to *P. nigromarmorata* in colour and structure but easily distinguished by the quite different wing pattern.

Male. Wing length 2 mm.

Wings (Text-fig. 5, *g*) with eight well defined black spots formed of dark macrotrichia; in addition there are dark macrotrichia along both branches of M and along the anal vein. In all other respects similar to *P. nigromarmorata*.

Female. Resembles male.

Holotype female in British Museum.

DISTRIBUTION. Known only from the type locality, CAPE PROVINCE: 3 ♀, 12.ii.53 and 1 ♂, 25.i.53 (*K. M. F. Scott*).

Pentaneura (Pentaneura) edwardsi sp. n.

A large dark species with plain wings belonging to Group D of Edwards' classification. Costa ending before level of M_{1+2}, legs yellow, abdomen dark, hypopygium pale.

Male. Wing length 3·5 mm.

Head, mouthparts, antennae brown, A.R. 1·2. *Thorax* brown, pleural membrane yellow; stripes dark brown and separated by pruinosity along the lines of the bristles, on the shoulders and prescutellar area; central stripe similarly split longitudinally; bristles dark brown, scutellum yellow. *Legs* yellowish, rather long, bristles normal, length about two or three times diameter of tibia; anterior tibia slightly longer than femur, those of middle legs about equal, posterior tibia one and a half times as long as femur. *Wings* unmarked, hyaline, thickly clothed with dark macrotrichia in all cells except costal and upper basal; costa reaching well beyond level of M_{3+4} but not beyond M_{1+2} (Text-fig. 7, *a*). Halteres white.

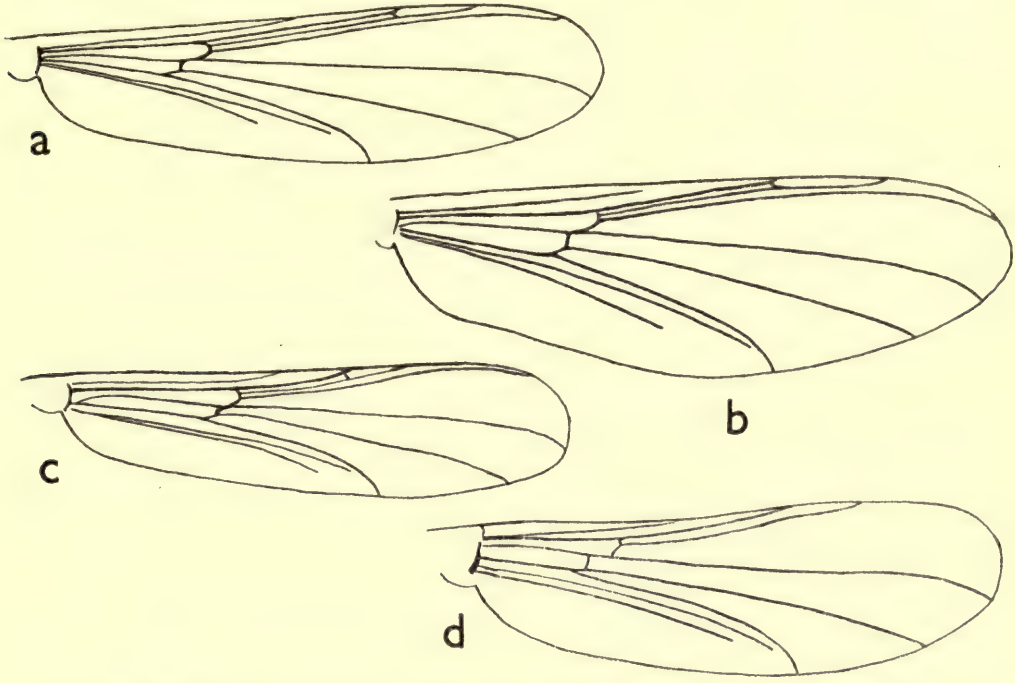

FIG. 7. Wings of *Pentaneura* sens. str. (*a*) *P. edwardsi,* male; (*b*) *P. longinervis,* female; (*c*) *P. meilloni,* male; (*d*) *P. comata,* male.

Abdomen dark, paler at the incisures, in segments 1–5 this paleness tends to spread obscurely; hypopygium white, simple.

Female not known.

Holotype male, KENYA, Aberdare Range, x.1934, Mt. Kinangop, 10,000 ft. (*F. W. Edwards*) in British Museum.

Pentaneura (Pentaneura) longinervis sp. n.

Another large species rather similar to *P. edwardsi,* and might at first be taken for the female of that species; the different venation with the costa reaching beyond M_{1+2} suggests that it belongs to a separate species.

Female. Wing length 5·0 mm.

Head, mouthparts and antennae brown, antennae 12-segmented, segment 2 twice as long as segment 3, palpi as long as antennae. *Thorax* blackish, stripes fused laterally, but shoulders and pronotum, a line dividing central stripes and prescutellar area yellowish and pruinose; lateral margins and lines of dorso-central bristles also pruinose, clearly demarcating lateral stripes; bristles dark, scutellum yellowish at apex. *Legs* yellowish brown, proportions as in *edwardsi*. *Wings* (Text-fig. 7, *b*) hyaline except for costal cell which is darker, thickly clothed with dark macrotrichia; costa reaching beyond level of apex of M_{1+2}. Halteres pale brownish yellow. *Abdomen* with blackish tergites and paler sternites, apices of segments pale, bristles black.

Male not known.

Holotype female, KENYA, Mt. Elgon, Heath Zone, 10,500–11,500 ft., ii.1935 (*F. W. Edwards*) in British Museum.

Pentaneura (Pentaneura) uniformis Goetghebuer

Ablabesmyia uniformis Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 363.

This species may be distinguished from other pale species with unmarked wings, except *pallidissima* Kieffer (*q.v.*), by the long costa which is considerably produced, also the posterior tibiae are one and a half times as long as the femora.

Male. Wing length 2 mm.

Head, antennae, mouthparts yellowish, A.R. 2·5. *Thorax* whitish, stripes, postnotum and sternopleuron yellowish brown. *Legs* very pale, hairs long but not as long as in *hirsuta*; posterior tibia one and a half times as long as tibia; L.R. 0·8. *Wings* quite unmarked, clothed all over with macrotrichia, costa produced and ending on a level with tip of M_{1+2}, r-m opposite base of M_{3+4}. Halteres pale. *Abdomen* whitish with dark basal bands on segments 2–6, 7 rather darker, hypopygium dark, styles and coxites simple.

Female. Similar to male in colour; antennae 12-segmented, hairs of legs shorter.

I have not seen the type, which is a female in Musée Royal du Congo Belge, but I have seen a specimen collected at the same time. Type locality Belgian Congo, Escarpement Kabasha, Chambi.

DISTRIBUTION. BELGIAN CONGO: 1 ♀, Escarpement Kabasha, Chambi, x.1933 (*de Wulf*); 1 ♂, Parc Albert, Cratère Mugunga, 1933 (*de Wulf*); 1 ♀, Rutshuru, 1285 m., 23–25.xii.33 (*G. F. de Witte*).

Pentaneura (Pentaneura) pallidissima Kieffer

Isoplastus pallidissimus Kieffer, 1911, *Trans. Linn. Soc. Lond.* **14**: 364.

The only specimen known of this species is the female holotype which is in the British Museum. Structurally it is indistinguishable from the female of *uniformis* Goetghebuer but is somewhat smaller (wing length 1·5 mm.) and more uniformly yellow. Until more material is available of both sexes of both species I am unwilling to synonymize them. Kieffer was wrong in saying that the costa was not produced.

Type locality, SEYCHELLES, Mahé, 1908–9 (*Percy Sladen Trust Exp. to Indian Ocean*).

Pentaneura (Pentaneura) meilloni sp. n.

Thorax yellowish brown with darker bristles, abdomen dark with pale rings at apices of segments 2–5, leg hairs short, wings quite unmarked.

Male. Wing length 2·0 mm.

Head, antennae and mouthparts brown, A.R. about 0·8. *Thorax* yellowish brown, stripes distinguishable because intervening areas are slightly pruinose, bristles long and dark brown, scutellum with long dark bristles, postnotum dark. *Legs* uniformly pale brown, hairs on posterior tibiae short, only 2–4 times diameter of tibia, anterior and middle tibiae and femur subequal, L.R. 0·7; posterior tibia longer than femur; pulvilli absent. *Wings* quite unmarked even at cross-vein, macrotrichia brown and numerous all over wing surface, except in the two basal cells; tip of costa slightly distal to M_{3+4} (Text-fig. 7, *c*), anal area reduced. Halteres pale. *Abdomen* dark with pale rings occupying apical half of segment 2 and apical third of segments 3–5, segments 1 obscurely pale; the dark areas bear long dark bristles almost as long as the segment.

Female very similar to the male; antennae 12-segmented, some macrotrichia in lower basal cell, abdomen without well defined rings.

Holotype male, and 2 ♂, 1 ♀, paratypes, TRANSVAAL, Johannesburg, iii.1930 (*B. de Meillon*) in British Museum. Other paratypes, same locality and collector, 1 ♂, 1 ♀, ii.1930, 2 ♀, v.1930.

Pentaneura (Pentaneura) hirsuta sp. n.

Quite similar to *meilloni* but easily distinguished by the longer posterior tibial hairs of the male, the pale thoracic bristles and more brilliant pruinosity on the shoulders.

Male. Wing length 2 mm.

Head, antennae and mouthparts yellowish brown; A.R. about 1·6. *Thorax* yellowish brown, stripes indicated by lines of pruinosity, shoulders and prothorax especially brilliant pruinose, bristles pale, not contrasting with background. *Legs* pale yellowish brown, hairs on posterior tibiae long, 6–8 times diameter of tibia, sometimes one-third length of tibia; L.R. 0·6, pulvilli absent. *Wings* as in *P. meilloni,* halteres pale. *Abdomen* with segments 1–5 pale with rather variable dark markings, remainder dark; segment 1 completely pale, 2 may be quite pale or it may be dark on the basal half, 3 and 4 usually dark on basal two-thirds, 5 may be largely pale or it may have dark markings; all segments with long hairs on basal halves, pale on pale areas, dark on dark areas. Hypopygium simple.

Female. Generally similar to male; antennae with 12 segments, hairs of body and legs pale, posterior tibiae without the long hairs, abdomen uniformly brown.

Holotype in British Museum.

DISTRIBUTION. Holotype male and 6 ♂, 2 ♀, paratypes, NATAL, Eshowe, Shaw's Drift, 14.ii–25.iv.35 (*B. de Meillon*). Other paratypes, NATAL; 1 ♂, Eshowe, Tributary to Umlalazi River, 27.iii.35 (*B. de Meillon*). Belgian Congo: 1 ♂,

Elisabethville, 1927 (*J. Schwetz*). Some specimens from FRENCH WEST AFRICA, Niger Province, Aïr, Mt. Baguezan, probably belong here ; they are very similar structurally but the thorax is rather darker and I prefer not to make them paratypes (*Inst. Fr. d'Afrique Noire*).

Pentaneura (Pentaneura) longipes sp. n.

Quite similar to the two preceding species but easily distinguished by the longer middle tibiae, darker femora and denser macrotrichia. Possibly the male of *palpalis*, but middle tibiae much longer.

Male. Wing length 2·5 mm.

Head, antennal pedicel and mouthparts yellow, flagellum and plumes dark, A.R. 2. *Thorax* whitish yellow with yellowish brown stripes, pruinose between stripes and on shoulders, bristles mainly golden. *Legs* with femora darker than tibiae and tarsi, which are whitish with pale hair, tibiae with short hairs as in *P. meilloni* ; anterior tibiae about equal in length to femur, L.R. 0·7 ; middle and posterior tibiae one and a half times as long as femora ; pulvilli absent. *Wings* as in *P. meilloni*, but more densely clothed with macrotrichia, which are especially dense at apex of costa ; halteres pale. *Abdomen* mainly dark with pale incisures, segments 1 and 4 mainly pale, whitish, hypopygium white ; hairs dark on dark areas, pale on segments 1, 4 and hypopygium. Hypopygium simple.

Female not known (but see *palpalis*).

Holotype male, UGANDA, Kampala, 4.ix.29 (*G. H. E. Hopkins*) in British Museum.

Pentaneura (Pentaneura) palpalis Goetghebuer

Ablabesmyia palpalis Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 362.

Although the palpi are as long as the antennae this is not an infrequent character in the genus ; the best distinguishing feature from all except *longipes* lies in the dense covering of dark hair on the wings.

Female. Wing length 2·5 mm.

Head, antennae and mouthparts brown ; palpi as long as antennae, antennae 12-segmented. *Thorax* with yellowish brown background and dark brown stripes, postnotum and sternopleuron ; mesonotum fairly heavily pruinose, bristles long and brown. *Legs* yellowish brown, not unduly hairy, L.R. about 0·8, posterior tibia one and a half times as long as femur, tibiae and femora of other legs more or less subequal (cf. *longipes*). *Wings* without markings, densely clothed with dark macrotrichia which are very dense at apex of costa, costa not produced, ending at a level half-way between apices of M_{1+2} and M_{3+4} as in *P. meilloni* (Text-fig. 7, *c*). Halteres white. *Abdomen* dark brown, quite densely clothed with dark hairs.

Male not known, but it is possible that *longipes* is the male of this species.

I have not seen the holotype, which is a female in the Musée Royal du Congo Belge, but Dr. Benoit has kindly compared the Natal specimen with it.

DISTRIBUTION. Type locality, BELGIAN CONGO : Rutshuru. NATAL : 1 ♀, Tugela River, 17.ix.53 (*A. D. Harrison*).

Pentaneura (Pentaneura) interrupta Goetghebuer

Ablabesmyia interrupta Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 361.

I have seen no specimens of this species. It is very similar to *P. hirsuta* but can be readily separated by the presence of a narrow grey band across the wing and by the arrangement of white on the abdomen. The following description is based on that given by Goetghebuer.

Male. Length 4 mm.

Yellowish ; pedicel yellow, flagellum black ; mesonotal stripes brown red ; sternopleuron and postnotum brown ; scutellum yellow. Abdomen with segments 1, 2, 4 entirely white and segments 3, 5, 6 and 7 spotted with brown black on their distal halves, 8 entirely brown black. Legs yellow, halteres white. A.R. 1·6, L.R. 0·45. Anterior tarsi not bearded, segment 4 twice length of 5, posterior legs with long hairs. Wings hyaline with a feeble narrow transverse smoky cloud in the middle and another at the apex. Hypopygium with style nearly straight.

Type locality, BELGIAN CONGO, Rutshuru, holotype in Museé Royal du Congo Belge.

Pentaneura (Pentaneura) aurantiacus Kieffer

Isoplastus aurantiacus Kieffer, 1911, *Trans. Linn. Soc. Lond.* **14** : 365.

I am doubtful whether the two specimens which form the type series of this species belong to the same species. No type was selected by Kieffer and as they are therefore cotypes I am selecting the one with obviously produced costa as lectotype. It is a brown insect with strongly produced costa.

Female. Wing length 1·3 mm.

Head brown, palpi broken, antennae 12-segmented, segments moniliform. *Thorax* dark brown, strongly pruinose, hairs shorter than usual, and brown. *Legs* pale, tarsi broken, posterior tibia equal to femur. *Wings* plain, unmarked ; R_{4+5} meeting costa opposite tip of M_{3+4}, costa strongly produced for about one third of the distance to M_{1+2}, r–m opposite base of M_{3+4}. Halteres pale. *Abdomen* dark brown.

Lectotype in British Museum.

DISTRIBUTION. Known only from SEYCHELLES, Mahé (*Percy Sladen Trust Exp. to Indian Ocean*).

Pentaneura (Pentaneura) minimus Kieffer

Isoplastus minimus Kieffer, 1911, *Trans. Linn. Soc. Lond.* **14** : 356.

A tiny species with plain wings, costa ending opposite M_{3+4}, abdomen with a central dark line. The holotype is a poor specimen gummed on to a piece of card and it is thus not possible to give a full diagnosis of the species, but it can be said that it has a certain resemblance to the "*Nilotanypus*" group of species. Distinguished from *micra* by its paler colour, longer costa and slightly larger size.

Male. Wing length 1 mm.

Head yellowish, palpi and antennae broken, eyes bare. *Thorax* yellowish brown with long brown hairs. *Legs* yellowish brown, hairs fairly long, tarsi broken,

posterior tibia probably equal to femur. *Wings* plain, thickly clothed with macrotrichia; costa rather retracted, ending opposite M_{3+4}. Halteres pale. *Abdomen* yellowish segments 1–5 with a median dorsal blackish line, apical segments blackish, hypopygium yellow.

Lectotype in British Museum.

DISTRIBUTION. Known only from the holotype, SEYCHELLES, Mahé (*Percy Sladen Trust Exp. to Indian Ocean*).

Pentaneura (Pentaneura) micra sp. n.

A minute fly with retracted costa; eyes bare, body dark, legs pale, apices of tibiae and tarsal segments darkened, antennae of female with 12 segments. Distinguished from *P. minimus* by its darker colour, greater retraction of costa and smaller size.

Female. Wing length 0·75 mm., body length 0·6 mm.

Head dark, palpi yellowish, antennae pale, with 12 segments; eyes bare. *Thorax* blackish and pruinose, bristles long and dark brown. *Legs* pale, tibiae and tarsi almost whitish with apices of segments darkened; posterior tibia equal to femur. *Wings* plain, unmarked, densely clothed with dark macrotrichia except in basal cells; costa retracted, ending well basal to level of apex of M_{3+4}, R_{2+3} appears to be absent. Halteres yellow. *Abdomen* entirely dark.

Holotype female and 9 female paratypes, NIGERIA: Niger Province, Abuja, 27.xii.54 (*R. Crosskey*), all in British Museum.

Pentaneura (Pentaneura) comata Freeman

Pentaneura comata Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B), **22**: 129.

A minute black insect without pale markings belonging to the group *Nilotanypus* which is characterized by the retracted costa, absence of R_{2+3}, wide separation of cross-veins and pubescent eyes. In the type series A.R. was about 1, but specimens received later from Cape Province have a lower ratio, one specimen being as low as 0·6. Two males from Uganda are extremely similar to the S. African specimens, but their antennal ratios are only 0·4. This is much the same as the ratio given by Kieffer for *P. remotissimus* but in that species the wings of the male are said to have macrotrichia reduced. I am assuming the antennal ratio to be variable and that Kieffer's species is separate.

Male. Wing length 1·0–1·4 mm.

Head black with greyish pruinosity; antennae with black plumes, A.R. variable, varying from 0·4–1·0; eyes clothed with short pubescence, separated dorsally by about twice their apical width. *Thorax* black, mesonotum with four broad stripes marked out in brownish-grey pruinosity, all hairs black. *Legs* translucent brown with dark hairs and no markings; anterior tarsi without beard, L.R. 0·6 *Wings* hyaline, unmarked, membrane evenly clothed, except in basal cell, with dark macrotrichia; costa retracted ending before tip of M_{3+4} (Text-fig. 7, *d*); R_{2+3} absent, base of M_{3+4} well basal to r-m. Halteres with pale knobs. *Abdomen* black, hypopygium with long black hairs.

Female very similar to male.

Holotype in British Museum.

DISTRIBUTION. CAPE PROVINCE: 4 ♂, 2 ♀, Berg River, Piquetberg, 9.ix.52–30.iv.53 (*K. M. F. Scott*) (type locality); 1 ♂, Cecilia's Drift, 21.i.53 (*K. M. F. Scott*); 1 ♂, Berg River, Wellington, 17.xii.52 (*K. M. F. Scott*). TRANSVAAL: 1 ♂, Kruger National Park, Letaba, 6.v.51 (*Swedish S. Afr. Exp.*). UGANDA: 2 ♂, Ruwenzori Range, Kilembe, 4,500 ft., xii.1934–i.1935 (*F. W. Edwards*).

Pentaneura (Pentaneura) remotissima Kieffer

Nilotanypus remotissimus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92**: 191.

I have seen no material of this species. As mentioned above under *P. comata* it appears to differ from that species mainly in the reduction of the macrotrichia on the wing membrane. Kieffer says that in the male macrotrichia are present only at the tip, and in the female they are sparse. It is possible that his specimens were rubbed, but even then the hair pits should have been visible. The antennal ratio is low—0·3–0·4, but, as mentioned under *P. comata*, this may not be significant. More material may show that the two species are the same.

Type locality ANGLO-EGYPTIAN SUDAN, Mongola.

Pentaneura Phillipi subgenus ***Ablabesmyia*** Johannsen

Isoplastus Skuse, 1889.
Ablabesmyia Johannsen, 1905 (in part); Goetghebuer, 1935 (in part).
Tanypus (Meigen) Kieffer, 1923.
Pentaneura Edwards, 1929 (Group A); Johannsen, 1946 (Group A); Freeman, 1953 (in part).

The males of this subgenus all possess a complex structure at the base of the coxites which has been studied by Johannsen in the North American species and which is probably a form of aedeagus. It is difficult to examine except in distended, mounted and stained specimens. I have not been successful in distending them artificially and I have, therefore, only been able to study them in specimens in which they are distended naturally, which form only a small proportion of the available material.

The structures seem to consist essentially of a pair of simple arms (Text-fig. 10, *d*) and two or three pairs of hairy lobes. So far as I can see there are specific differences in the shapes of the parts.

The apex of the style is also unusual. The spine is subapical and the true apex of the style is flattened and fluted; it is often also expanded and disc-like. The other characters of the subgenus are given in the key on p. 21, the characters concerning the definition of the prescutellar area and the divergence of the acrostichal bristles around it, do not seem to have been noted before.

KEY TO AFRICAN SPECIES OF *Pentaneura* SUBG. *Ablabesmyia*

1. Wings without well developed marbled pattern, cell R_{4+5} without areas of dark macrotrichia 2
   Wings with well marked marbled pattern, cell R_{4+5} with at least one area of dark macrotrichia 3

2. Costa produced, wings pale, basal third greyish . . . . . *digitata* Kieffer
   Costa not produced, wings clear and unmarked except for a grey spot at apex of R_{2+3} *subrecta* Kieffer
3. Thorax with cross-banded appearance (Text-fig. 8, *a*), femora and tibiae each with four black rings (Text-fig. 8, *c*) . . . . . *nilotica* Kieffer
   Thorax not cross-banded, femora usually with less than four rings 4
4. Pattern simpler, as in Text-fig. 9, *b*, cell R_{4+5} with only two spots 5
   Pattern more complex 6
5. Cell M_{1+2} with a central spot . . . . . *melaleuca* Goetghebuer
   Cell M_{1+2} without a central spot . . . . . *rufa* Kieffer
6. Cell R_{4+5} with a quadrate central spot and two pairs of superposed spots in the outer half (Text-fig. 9, *c*) . . . . . *appendiculata* Kieffer
   Central spot in cell R_{4+5} is not quadrate (Text-fig. 9, *d*, *e*), outer spots not superposed 7
7. Larger species, wing length 2–3·5 mm., normally with black spots at the apices of R_1, R_{2+3}, and R_{4+5}, female antenna with 12 segments. . . *dusoleili* Goetghebuer
   Smaller species, wing length 1·3–1·6 mm., black spots at apices of R_1 and R_{4+5} only, female antenna with 11 segments . . . . . *pictipes* Kieffer

Pentaneura (Ablabesmyia) digitata Kieffer

Tanypus digitatus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 193.

I have seen no specimens of this small species, but it should be easy to recognize because of the produced costa and pale wings. The following is a summary of its characters taken from Kieffer's description.

Female. Length 1 mm.

Antennae 12 segmented; thoracic bands and markings yellowish; wings pale (? abraded), proximal third slightly greyish, a grey spot at apex of R_{2+3}; costa produced for about length of r-m cross-vein; femora with two black rings, one at the middle, the other subapical; tibiae black with three narrow white rings; anterior tibial spur dentate, with five free teeth, the middle one twice as long as the others.

Type locality, FRENCH CAMEROONS: Kribi.

Pentaneura (Ablabesmyia) subrecta Kieffer

Tanypus subrectus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 199.

I have seen no specimens of this species which was described from a female 1·5 mm. long. According to Kieffer's description it should not be difficult to recognize because the wings (? abraded) have no markings except for a grey spot at the apex of R_{2+3}. Antennae 12-segmented, Cu_1 not strongly curved, femora with two black rings one at the middle and one subapical, tibiae black with three narrow white rings.

Type locality, FRENCH CAMEROONS: Kribi.

Pentaneura (Ablabesmyia) nilotica Kieffer

Tanypus niloticus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 200.
? *Tanypus congoensis* Kieffer, 1923, *Ibid.* **92** : 198.
? *Tanypus kribiensis* Kieffer, 1923, *Ibid.* **92** : 202.
Ablabesmyia tricolor Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 363 (SYN. NOV.).

This species is recognized by the cross-banded thorax, heavily banded legs and dark wings.

The description given by Kieffer of *niloticus* mentions the pale anterior third of the mesonotum and the four bands on tibiae and femora ; there seems to be doubt that this is an earlier description of the species later described by Goetghebuer under the name *tricolor*.

Under *T. congoensis* Kieffer mentions the dark wings with many poorly defined pale spots and the dark legs, though in his specimens the tibiae were black with two white rings beyond the middle (there is an error in his key at couplet 7, the names

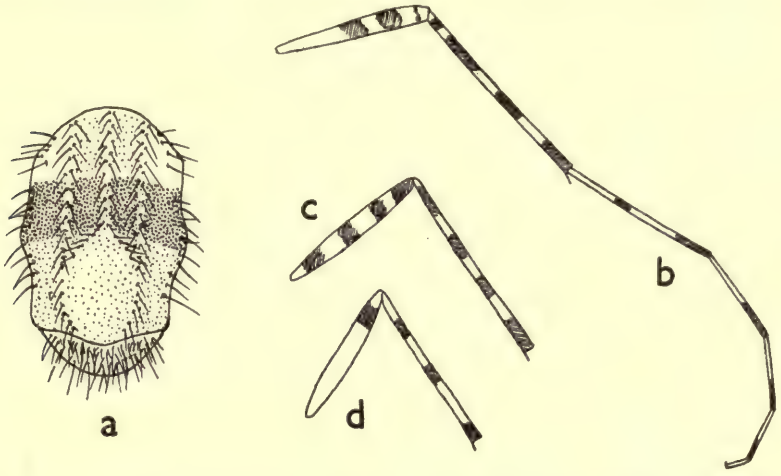

FIG. 8. Thorax and legs of *Pentaneura* (*Ablabesmyia*). (*a*) thorax of female *P. niloticus* ; (*b*) posterior leg of male *P. appendiculata* ; (*c*) the same of *P. nilotica* ; (*d*) the same of *P. melaleuca*.

congoensis and *bicinctus* should be interchanged). I have a series of females from the southern Anglo-Egyptian Sudan not unlike this description in colour, but the specimens are much smaller ; I am tentatively identifying them as *niloticus* until I can examine a male, although the thoracic pattern is not very typical. The description given by Kieffer of *kribiensis* is poor, but he mentions the grey wing colour with numerous pale spots and the presence of three dark rings on the femur and four on the tibia which suggests that it is another description of *niloticus*.

Male. Wing length 1·8–2·3 mm.

Head, mouthparts and pedicel brown, flagellum paler, A.R. 1·5. *Thorax* pruinose and with cross-banded appearance (Text-fig. 8, *a*) ; anterior third pale, remainder either more or less uniformly dark or with the dark area only present as a transverse stripe, as shown in the figure ; remainder of thorax brown. *Legs* with four dark rings on both femora and tibiae (Text-fig. 8, *c*), usually more or less as shown, but widths of rings variable to some extent, basal ring of tibia always long (cf. that of *appendiculatus*) ; markings of tarsi as in *appendiculatus*. *Wings* (Text-fig. 9, *a*) with dark macrotrichia arranged in a mottled pattern ; darker markings are present over

r-m cross-vein and as a band at level of apical section of R_{2+3}. Halteres whitish. *Abdomen* with segments 1–5 mainly white, segments 6–8 dark with white incisures; segments 2–5 dark along lateral margins and with a double banded appearance due to the extension towards the centre of the ends of these dark markings; anterior dark extension may reach across as a complete band, posterior one does not; incisures of these segments pale. Hypopygium (Text-fig. 10, *a*) with characteristic coxites which tend to appear transverse, basal structures not everted in any of the specimens at my disposal, but appear to be different from *dusoleili* and *appendiculatus*; apical portion of style not strongly expanded, bristle pointed.

Female. Resembles male in pattern, but is darker and more contrasted in colouring. Abdomen dark, apices of segments paler, antennae 12-segmented.

I have not seen any of the types of the species listed; the types of Kieffer's species appear to be lost, that of *tricolor* is in Musée Royal du Congo Belge. Type locality of *niloticus* is ANGLO-EGYPTIAN SUDAN, Shambe; of *congoensis* is BELGIAN CONGO, District Uelle, Go; of *kribiensis* is FRENCH CAMEROONS, Kribi; of *tricolor* is BELGIAN CONGO, Parc National Albert, Vitshumbi.

DISTRIBUTION. ANGLO-EGYPTIAN SUDAN: 1 ♀, Khartoum, i.1923 (*S. Hirst*); 1 ♂, Wad Medani, ii.1952 (*D. J. Lewis*); 1 ♂, Khartoum, 24.i.53 (*D. J. Lewis*); 1 ♂, Adok, 21.xi.53 (*E. T. M. Reid*). NIGERIA: 2 ♀, Mokwa, 27.ix.09 (*Mayer*); 1 ♂, Gadau, ii.1933 (*Buxton & Lewis*); 2 ♂, Onishta (*Anderson*). BELGIAN CONGO: 2 ♂, 5 ♀ Parc National Albert, vi–ix–1935 (*H. Damas*). TANGANYIKA: 1 ♀, Kibanga 7.v.27 (*C. Christy*). S. W. AFRICA: 5 ♀, Kaokoveldt, Ohopoho 4.vi.51 (*Swedish S. Afr. Exp.*)

Pentaneura (Ablabesmyia) melaleuca Goetghebuer

Ablabesmyia melaleuca Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 360.

Wings with fewer markings than in some other species and without well marked black spots on the costa, femora with one black ring, tibiae with three, coxites of male hypopygium angled at the base. Specimens in which the spot in cell M_{1+2} is poorly developed resemble *rufus* Kieffer, which may thus be an earlier name for this species.

Male. Wing length 2·5 mm.

Head, mouthparts and pedicel brown, flagellum paler, plumes yellowish, A.R. 1·75. *Thorax* with blackish brown stripes separated by pruinosity, hairs yellowish, remainder of thorax blackish brown. *Legs* (Text-fig. 8, *d*); femora with subapical dark ring, tibiae with three rings, tarsi as in *appendiculatus*. *Wings* paler than in most species, with black spots on r-m cross-vein and base of posterior fork but with none on costa; dark macrotrichia arranged as shown in Text-fig. 9, *b*, but individual spots may be greater or smaller in different specimens, spot in centre of cell M_{1+2} seems sometimes to be absent. Halteres white. *Abdomen* with segments 1–5 white with variable amount of darker marking, remainder dark. Hypopygium as in Text-fig. 10, *c*; basal coxite structure not expanded in my specimens, but may be like *niloticus* though smaller, coxites with well marked angle at base, apex of style longer than in other species, not unlike that of *niloticus*.

Female. Wing length of available specimens only 2 mm. Antennae 12-segmented, coloration similar to male except for the abdomen which is dark with the segments only obscurely paler at their apices.

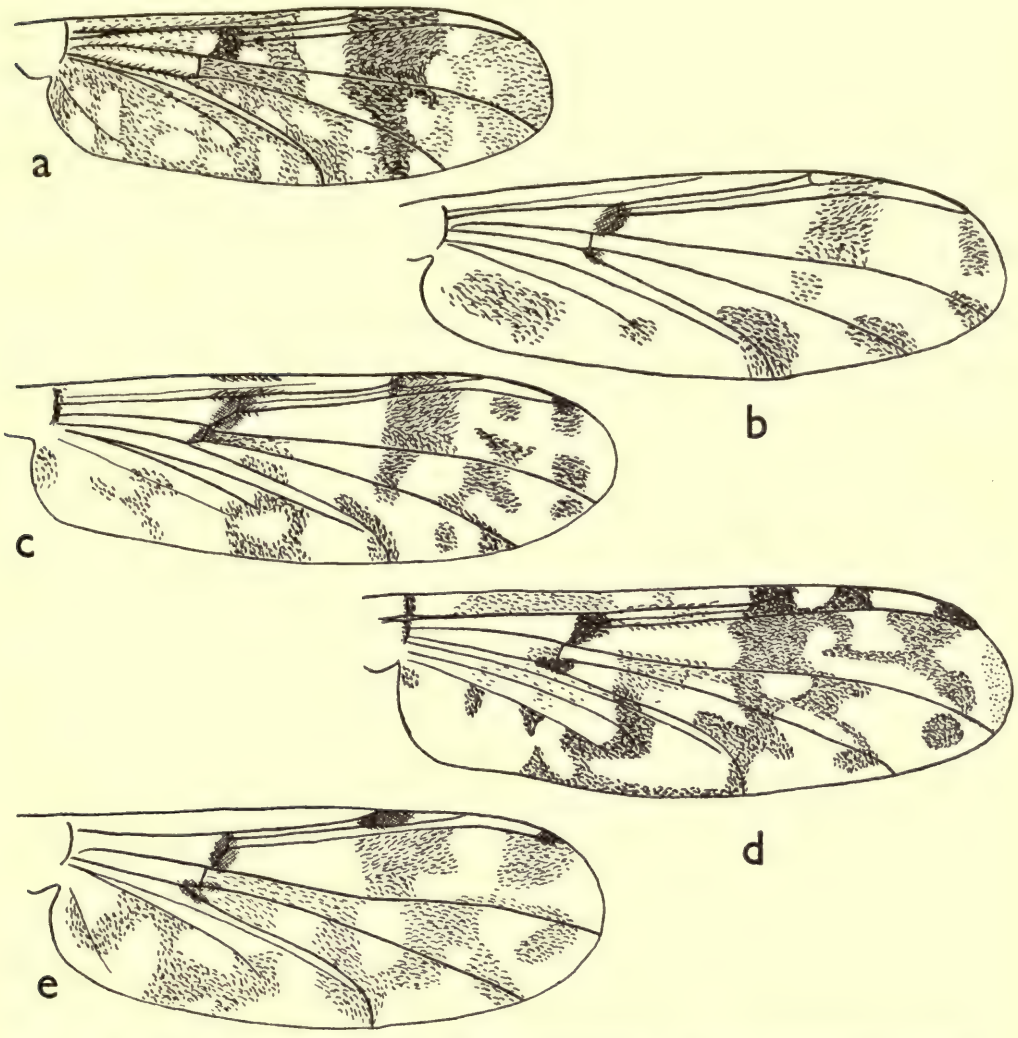

FIG. 9. Wings of females of *Pentaneura* (*Ablabesmyia*), areas of dark macrotrichia only indicated. (*a*) *P. nilotica*; (*b*) *P. melaleuca*; (*c*) *P. appendiculata*; (*d*) *P. dusoleili*; (*e*) *P. pictipes.*

I have not seen the holotype, which is a male in Musée Royal du Congo Belge Type locality, BELGIAN CONGO, Uganda, Numasgali.

DISTRIBUTION. SIERRA LEONE: 1 ♂, Waterloo, vii.1924 (*A. Blacklock*). GOLD COAST: 1 ♂, 2♀, Ashanti, Obuasi (*W. M. Graham*). NIGERIA: 1 ♂, Onitsha,

x.1932 (*Anderson*). BELGIAN CONGO: 1 ♂, Likimi, 16.xii.27 (*A. Collart*); 1 ♀, "Congo."

Pentaneura (Ablabesmyia) rufa Kieffer

Tanypus rufus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92**: 197.

I have seen no specimens of this species, which was described from a female 1·5 mm. long. The important features of the species are the wing markings, of which the following summary is taken from the original description: there are three black spots, one on r-m, one at the fork of R_{2+3}, the third at the apex of R_{4+5}; there are two grey spots in cell R_{4+5}, two in the anal cell and two in the posterior fork, one being along the posterior branch and the other at the apex of M_{3+4}. Each femur has a black ring at the apex, whilst there are four black rings on the anterior tibia, the other tibiae have three only.

As already noted, there is a certain resemblance to some specimens which I have placed in *melaleuca*, and it may prove to be an earlier name for that species. Owing to the great variability it is not possible to be more precise until hypopygia have been examined of specimens agreeing with the description.

Type locality FRENCH CAMEROONS, Kribi. The holotype appears to be lost.

Pentaneura (Ablabesmyia) appendiculata Kieffer

Tanypus appendiculatus Keiffer, 1923, *Ann. Soc. ent. Fr.* **92**: 201.
? *Tanypus bicinctus* Kieffer, 1923, *Ibid.* **92**: 198.
Ablabesmyia collarti Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 358 (SYN. NOV.).

Very similar to *P. dusoleili* but spots at apex of cell R_{4+5} usually superposed and costal margin without three distinct black spots, femora with two or three well defined black rings, tibiae usually with four. According to Kieffer's description, *T. bicinctus* has fewer wing spots, there being only two superposed ones in cell R_{4+5}; it is difficult to be certain of its placing with the material at my disposal.

Male. Wing length 2·2–3·3 mm.

Head and thorax as in *P. dusoleili* (see below). *Legs* (Text-fig. 8, *b*) with broader bands than in *dusoleili*, femora with at least two and usually three bands which vary greatly in width and position even on different legs on the same specimen; the basal one is often broader than shown and in the basal half of the femur; tibiae with four bands, remainder as shown. *Wings* with variable markings but usually as shown in Text-fig. 9, *c*; costa with dark macrotrichia at level of r-m which is darkened, and at apices of R_1 and R_{4+5}, but without three distinct spots; cell R_{4+5} with large spot which is more or less quadrate and with two pairs of superposed spots in apical half; remainder of markings not unlike *dusoleili*. Halteres white. *Abdomen*: segment 1 white, 2–4 or 5 white with lateral margins brown, brown colour extends inwards anteriorly and posteriorly on each segment, but incisures broadly pale, apical segments dark. Hypopygium (Text-fig. 10, *b*) differs from *dusoleili* in the smoother outline of the coxites; basal median sclerite more V-shaped, basal aedeagal structure not expanded in any of my specimens, but probably similar to *dusoleili*, style also similar, apex perhaps more expanded.

Female. Similar to male, except for abdomen which is dark with apices of segments narrowly pale.

I have seen no type material. The types of *appendiculatus* and *bicinctus* appear to be lost; locality of the former FRENCH CAMEROONS, Kribi, of the latter BELGIAN CONGO, Uelle, Go. The type of *collarti* is in Musée Royal du Congo Belge (type locality, BELGIAN CONGO, Stanleyville).

DISTRIBUTION. ANGLO-EGYPTIAN SUDAN: 1 ♂, Melut, 17.xi.53 (*E. T. M. Reid*). NIGERIA: 1 ♀, Katagum (*C. E. S. Watson*); 1 ♀, Ibi (*J. M. Pollard*). GOLD COAST: 1 ♀, Accra, vii.1916 and 1 ♀, Oblogo, 25.xii.20 (*J. W. S. Macfie*); 1 sex?, Kete Krachi, 12.x.98. UGANDA: 1 ♀, Kaduku Lango, 29.vi.11 (*R. E. McConnell*); 3 ♂, 3 ♀, Lake Bunyori, 1.viii.32 (*G. H. E. Hopkins*); 1 ♂, Entebbe, 11.v.35 (*C. B. Symes*); 1 ♀, L. Victoria (*W. W. MacDonald*). BELGIAN CONGO: 1 ♀, Yambinga, 9.iv.04 (*Dutton & Todd*); 1 ♂, Stanleyville (*Mouchet*); 1 ♂, Kwango Prov., Muela, 15.x.37 (*A. Duren*). NYASALAND: 1 ♀, Dedza Distr., vii.1913 (*J. B. Davey*). TRANSVAAL: 1 ♂, Kruger National Park, Letaba, 1.v.51 (*Swedish S. Afr. Exp.*). NATAL: 1 ♂, 7 ♀, Tugela and Mooi Rivers, 22–30.ix.53 (*A. D. Harrison*).

Pentaneura (Ablabesmyia) dusoleili Goetghebuer

Pelopia monilis var. Kieffer, 1914, *Ann. S. Afr. Mus.* **10**: 268.
Ablabesmyia dusoleili Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 359.
Pentaneura dusoleili Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**: 128.

This species is extremely similar to the Palaearctic species *P. monilis* Linn., but there are hypopygial differences which suggest that the species are distinct. I have not examined the type, but I have seen material of the species, borrowed from the Musée Royal du Congo Belge, collected at the same time and place as the holotype but not studied by Goetghebuer. In addition, Dr. Benoit has very kindly confirmed the presence of wing markings in the holotype which Goetghebuer omitted in his figure of the wing.

It is a common and variable species, varying both in size and extent and darkness of the wing pattern. It can be separated in the typical form from all other African species known to me by the three black spots at the apices of R_1, R_{2+3}, and R_{4+5}. The wings are strongly mottled, femora with a dark apical or subapical ring and often with a white ring basal to this; closely resembles *P. monilis*, but male coxites with pronounced basal rounded swelling, longest aedeagal process blunt ended (this is pointed in *monilis*), also the median internal strut is wider than in *monilis*.

Male. Wing length 2·0–3·5 mm.

Head, mouthparts and pedicel blackish brown, flagellum paler, A.R. about 2. *Thorax* with greyish brown stripes; shoulders, lines of bristles, prescutellar area heavily pruinose; bristles whitish; scutellum pale or dark brown, postnotum and pleura largely blackish. *Legs* very like those of *melaleuca* (Text-fig. 8, *d*), femora usually only dark at apex, or just below to apex, but sometimes basal two-thirds obscurely darkened as well, and then there is a white ring just basal to the apical dark band; tibiae either with three bands much as in *melaleuca*, or with an extra

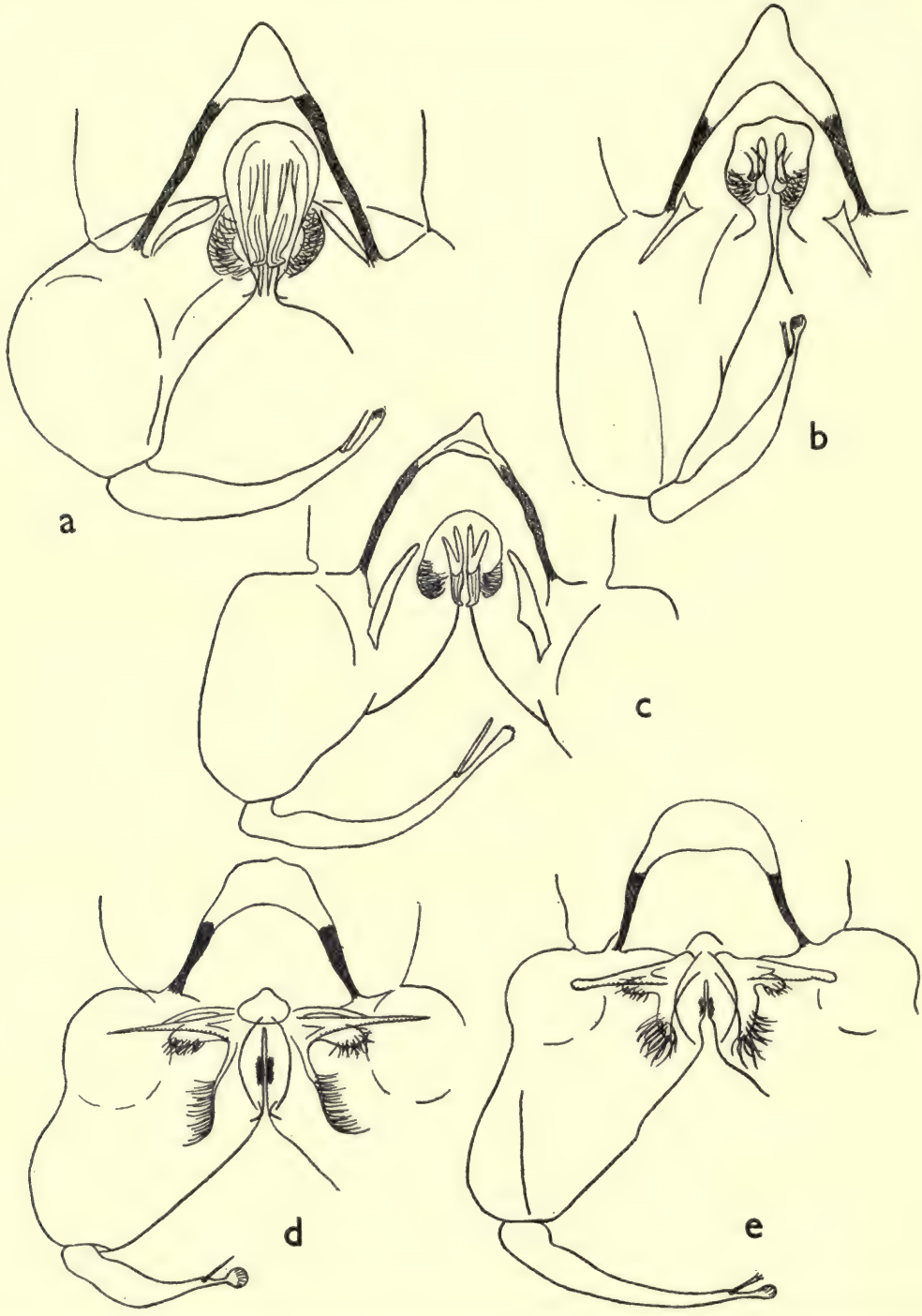

FIG. 10. Male hypopygia of *Pentaneura* (*Ablabesmyia*). (*a*) *P. nilotica*; (*b*) *P. appendiculata*; (*c*) *P. melaleuca*; (*d*) *P. pictipes*; (*e*) *P. dusoleili*.

small basal band as in *appendiculata* (Text-fig. 8, *b*), widths of all bands variable ; basitarsus with a narrow band just basal to the middle and an apical black band, segments 2–4 black apically (as in Text-fig. 8, *b* of *appendiculata*). *Wings* (Text-fig. 9, *d* of female) with black markings on r-m cross-vein, posterior fork and apices of R_1, R_{2+3}, and R_{4+5} ; remainder of wing markings variable but usually there are dark macrotrichia arranged more or less as shown ; the large spot in cell R_{4+5} has quite a characteristic shape with an apical extension to its anterior edge. Halteres white. *Abdomen* with segments 1–5 white with some dark markings laterally on each segment, segments 6–7 dark, 8 and styles paler. Hypopygium (Text-fig. 10, *e*) with basal structures as shown, coxites with rounded basal prominence ; the main arm of the basal structures is straight and blunt ended ; styles with enlarged and fluted apex, bristle truncate and with three small hairs at apex.

Female. Very similar to male in pattern and colouring, except for the abdomen which is dark with the extreme apical margin paler ; antennae either 12-segmented or with the basal flagellar segment indistinctly divided to make 13.

Holotype female in Musée Royal du Congo Belge ; type locality BELGIAN CONGO, Uganda, Namasagali.

DISTRIBUTION. EGYPT : 3 ♀, Moascar, iii–iv.42 (*J. W. S. Macfie*). ANGLO-EGYPTIAN SUDAN : 1 ♀, nr. Assuan, 1923 (*S. Hirst*) ; 4 ♂, Khartoum, iv.1952 (*D. J. Lewis*) ; 21 ♀, Melut, Tonga and Shambe. 17–22.xi.53 (*E. T. M. Reid*). DAHOMEY : 1♀, Djougou, 28.v.54 (*J. Hamon*). ABYSSINIA : 2 ♀, Waldia, i.1936 (*J. W. S. Macfie*). KENYA : 1 ♂, Nairobi, iii.1924 (*van Someren*). BELGIAN CONGO : 3 ♀, Uganda, Namasagali, 16.iv.29 (*G. du Soleil*) ; 2 ♀, Elisabethville, 24.xii.38 (*H. J. Brédo*) ; 1 ♀, Kalondo (Kivu), viii.53. S. RHODESIA : 1 ♀, Salisbury, i.1900 (*G. A. K. Marshall*) ; 1 ♀, Melsetter ii.1929. TRANSVAAL : 1 ♀, Johannesburg, v.1930 (*B. de Meillon*). NATAL : 1 ♀, Estcourt, ix–x.1896 (*G. A. K. Marshall*) ; 1 ♀, Weenen, iii.1925 (*H. P. Thomasset*) ; 13 ♂, 2 ♀, Bushman's and Mooi Rivers, 22–30.ix.53 (*A. D. Harrison*). CAPE PROVINCE : Berg River, numerous examples (*K. M. F. Scott*).

Pentaneura (Ablabesmyia) dusoleili ? var.

There are some specimens from South Africa which have wing markings and male hypopygium extremely similar to normal *dusoleili* but in which there are black spots at the tips of R_1 and R_{4+5} only. These may be a distinct species or only a variety.

DISTRIBUTION. TRANSVAAL : 1 ♀, Kruger National Park, 6.v.51 (*Swedish S. Afr. Exp.*). NATAL : 1 ♂, 1 ♀, Estcourt, 22.ix.53, 1 ♀, Newcastle, 23.ix.53, 1 ♂, Colenso, 22.ix.53 (all coll. *A. D. Harrison*) ; 2 ♀, Ladismith, 4.i.51 (*Swedish S. Afr. Exp.*). CAPE PROVINCE : Berg River, series of both sexes (*K. M. F. Scott*).

Pentaneura (Ablabesmyia) pictipes Kieffer

Tanypus pictipes Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 194.
Tanypus variiforceps Kieffer, 1923, *Ibid.* **92** : 195 (SYN. NOV.).
Tanypus marginatus Kieffer, 1923, *Ibid.* **92** : 196 (SYN NOV.).
Tanypus reductus Kieffer, 1923, *Ibid.* **92** : 196 (SYN. NOV.).
Tanypus contracticornis Kieffer, 1925, *Bull. Soc. R. ent. Egypte*, **1924** : 311 (SYN. NOV.).

This species differs from all others known to me from Africa by the short female antennae, which have 11 segments only. All the species mentioned in the synonymy were described from the Anglo-Egyptian Sudan or from Egypt, all were described as having only 11 segments in the female antennae, and the differences between them seem to be very superficial. I am therefore regarding them as redescriptions of the same species.

It is a small insect with black spots at the apices of R_1 and R_{4+5} as well as at the cross-vein, male abdomen uniformly brown, longest aedeagal arm pointed.

Male. Wing length 1·3–1·6 mm.

Head, mouthparts brown, pedicel blackish, flagellum pale, A.R. 1·5. *Thorax* mottled with pruinosity, stripes blackish, scutellum pale, remainder dark. *Legs* ringed; femur with subapical dark ring and usually, though not always, traces of at least one ring or band on the basal half; tibiae with three rings only, as shown in Text-fig. of *melaleuca*; tarsal rings as in *appendiculata* (Text-fig. 8, *b*) but segment 4 only about one and a half times as long as 5. *Wings* (Text-fig. 8, *e*) rather blunt-ended and with black markings over r-m cross-vein, base of posterior fork and apices of R_1 and R_{4+5}; other markings due to black macrotrichia as shown in Text-figure; costa ending only a little beyond level of apex of M_{3+4}. Halteres white. *Abdomen* uniformly brown without white markings. Hypopygium (Text-fig. 10, *d*) with broad short coxites which are swollen basally; main arm of basal aedeagal structure pointed; apex of style disc-like and striated, bristle pointed, style itself short and bent.

Female. Antennae short, segments moniliform and 11 in number; remainder of insect very like the male.

The types of Kieffer's species all seem to be lost. *T. pictipes, variiforceps,* and *reductus* were all described from Anglo-Egyptian Sudan, Shambe; *marginatus* from Sudan, between Wad el Zaki and Shabasha Shary; *contracticornis* from Egypt, Cairo.

DISTRIBUTION. ANGLO-EGYPTIAN SUDAN: series of both sexes taken at light at Khartoum and Wad Medani, ii.1952 (*D. J. Lewis*) and Melut, 17.xi.53 (*E. T. M. Reid*). KENYA: 1 ♂, Kisumu, 13.v.35 (*C. B. Symes*).

Genus *ANATOPYNIA* Johannsen

Anatopynia Johannsen, 1905, *Bull. N. Y. State Mus.* **86**: 135; Edwards, 1929, *Trans. ent. Soc. Lond.* **77**: 297.

Psectrotanypus Kieffer, 1909, *Bull. Soc. Metz* 26, **42** *nec* Kieffer, 1923, *Ann. Soc. ent. Fr.* **92**: 202 (see *Pentaneura cygnus*).

Macropelopia Thienemann, 1916, *Arch. Hydrobiol. Suppl.* **2**: 497.

Wing membrane clothed with macrotrichia; costa strongly produced; R_2 present and distinct; basal section of M_{3+4} present and posterior fork just basal to this as in *Pentaneura*; antennae of female 15-segmented; pulvilli present or absent.

Of the four African species known to me *schwetzi* and *marmorata* are similar to the Palaearctic species allied to *A. nebulosa* Meigen (group or subgenus *Macropelopia* Tnm.). The other two species are not so typical and have plain unmarked wings; they do not fall into the groups recognized by Edwards.

KEY TO AFRICAN SPECIES OF *Anatopynia*

1. Wings plain and unmarked 2
   Wings with patches of dark macrotrichia on the membrane 3
2. Small blackish species (wing length 2 mm.); L.R. 0·75; pulvilli absent *unicolor* Freeman
   Larger greenish species (wing length 3 mm.); L.R. 1·0; pulvilli present *petersi* sp. n.
3. Wing pattern as in Text-fig. 11, *a*; knees broadly darkened . . . *schwetzi* sp. n.
   Wing pattern as in Text-fig. 11, *b*; knees hardly darkened . . . *marmorata* sp. n.

Anatopynia schwetzi sp. n.

A perfectly typical species of the genus, belonging to the group *Macropelopia*, separated from *A. marmorata* by the larger size and arrangement of dark macrotrichia in cell R_{4+5}; knees broadly darkened, pulvilli absent.

Male. Wing length 4 mm.

Head brown, mouthparts and scape darkened, flagellum and plumes pale, A.R. 1·8. *Thorax* with blackish stripes, shoulders, lines of bristles and prescutellar area yellowish brown and pruinose, two patches of pruinosity just in front of scutellum are particularly conspicuous; prothorax, scutellum, postnotum yellowish brown, pleura blackish. *Legs* pale, knees broadly darkened, tips of tibiae also dark, anterior tibia one and a quarter times as long as femur, L.R. 0·6, pulvilli absent. *Wings* with dark macrotrichia arranged as in Text-fig. 11, *a* of the female, but pattern not so sharply defined; membrane stained in the areas shown shaded; costa produced, R_{2+3} ending beyond M_{3+4}. Halteres white. *Abdomen* brown, clothed with long hairs laterally and short ones dorsally, segments translucent, styles simple.

Female. Resembles male but wing pattern (Text-fig. 11, *a*) stronger, with staining beneath the dark macrotrichia, deeper where shaded; antennae with 15 segments.

Holotype male and 1 female paratype, BELGIAN CONGO, Ruanda Urundi (*J. Schwetz*) in British Museum; 1 further female paratype UGANDA, Kabale, vii.1932 (*G. H. E. Hopkins*).

Anatopynia marmorata sp. n.

Smaller than *schwetzi*; wings mottled, membrane more deeply stained beneath the dark macrotrichia; knees not strongly darkened; R_{2+3} ending above M_{3+4}.

Male. Wing length 3 mm.

Head and mouthparts brown, antennae paler, A.R. 1·5. *Thorax* brown, stripes outlined by pruinosity on shoulders and along lines of bristles. *Legs* pale yellowish, femora brown apically, tibiae slightly so basally, proportions of front legs as in *schwetzi* pulvilli absent. *Wings* (Text-fig. 11, *b* of female) marbled with patches of light and dark macrotrichia, membrane more heavily stained in the dark areas than it is in *schwetzi*; R_{2+3} ending at same level as apex of M_{3+4}. Halteres yellow. *Abdomen* with segments 1–4 whitish, with posterior third of each of segments 2–4 brown, terminal segments brown.

Female. Very similar to male, thorax darker, abdomen all brown; antennae 15-segmented.

Holotype female and 2 female paratypes, CAPE PROVINCE: Ceres, iv.1925 (*R. E. Turner*) in British Museum. Other paratypes: CAPE PROVINCE: 1 ♂, Cape Tradower Pass, 4.i.51 and 1♀, " Cape " (*Swedish S. Afr. Exp.*).

Anatopynia unicolor Freeman

Anatopynia unicolor Freeman, 1954, *Proc. R. ent. Soc. Lond.* (B) **23** : 172.

This species was originally described from a single male in which the postnotal furrow was hardly visible. The Swedish South Africa Expedition collected a female which appears to correspond to the other sex. This female has 15-segmented antennae, and the postnotal furrow is better developed than in the male.

A small dark species without any markings on either wings or body ; postnotal furrow reduced, especially in the male ; pulvilli absent ; costa produced, r-m rather long.

Male. Wing length 2·0 mm.

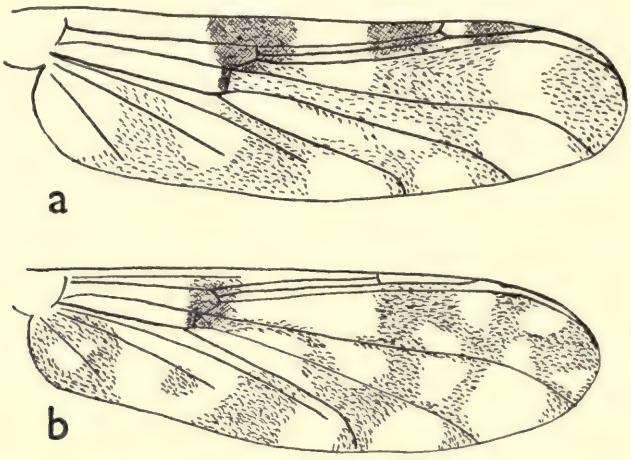

FIG. 11. Wings of female *Anatopynia*, only areas of dark macrotrichia shown. (*a*) *A. schwetzi* ; (*b*) *A. marmorata*.

Head blackish, palpi rather short, eyes bare, antennae with well developed plumes, A.R. 1·0. *Thorax* black, pruinose, prothorax not as large as in some species of *Anatopynia*, scutellum brown, postnotum in the only known male with reduced longitudinal furrow which is only just distinguishable under a high power. *Legs* brown, unmarked, L.R. 0·75, pulvilli absent, empodium well developed and long. *Wings* unmarked, densely covered with macrotrichia over most of their surface ; costa produced, reaching nearly half way to M, R_{2+3} well developed and forked, r-m long. Halteres yellow. *Abdomen* uniformly dark, hypopygium normal, styles simple, tapered and with a single apical spine.

Female. Very similar to the male in colour and wing venation ; antennae 15-segmented, postnotal furrow readily visible, L.R. 0·6.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE : 1 ♂, Berg River, Assegaibos Waterfall, 23.xii.52 (*K. M. F. Scott*) (type locality) ; 1 ♀, Upper Berg River, 4.vii.51 (*Swedish S. Afr. Exp.*).

Anatopynia petersi sp. n.

This species is in some ways intermediate between *Anatopynia* and *Pentaneura*, but as the costa is strongly produced I have placed it in the former. The prothorax is rather reduced, but there seems to be no clear-cut distinction between the two genera in this character. When a female can be examined, the segmentation of the antennae may show more firmly into which genus it should really be placed.

Thorax greenish with yellow-brown markings, abdomen green, segments 2–5 with dark bands, L.R. 1·0, wings unmarked. Separated from *A. unicolor* by the larger size, paler colour, greater L.R. and presence of pulvilli.

Male. Wing length 3 mm.

Head green, palpi well developed, dark green; pedicel dark brown, A.R. 2·0. *Thorax* green with yellow-brown stripes, sternopleuron and postnotum; bristles long and brown; prothorax rather reduced for *Anatopynia*. *Legs* greenish, L.R. 1·0, pulvilli well developed. *Wings* clear and unmarked, fairly thickly clothed with macrotrichia; costa produced for about one third of distance to M. Halteres green. *Abdomen* green, segments 2–5 with a pale brown transverse band in the basal half, apical segments darker; bristles long and dark. Hypopygium with simple coxites and styles; coxites with two inner denser patches of setae, styles flattened in apical half, with well developed setae and an apical spine which is longer and thinner than usual.

Female. Not known.

Holotype male, TANGANYIKA: Njombe, 6–6,500 ft., 7.1.52 (*W. Peters*) in British Museum. Paratype, BELGIAN CONGO: 1 ♂, Elizabethville, 17.xii.38 (*H. J. Brédo*) in Institut Royal des Sciences Naturelles de Belgique.

Genus *TANYPUS* Meigen.

Tanypus Meigen, 1803, *Illiger's Mag.*, **2** : 261 ; Edwards, 1929, *Trans. ent. Soc. Lond.* **77** : 299 ; Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 353.
Protenthes Johannsen, 1907, *Ent. News* **18** : 400 ; Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 187.
Trichotanypus Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or., Ins. Dipt.* **1** : 13 (nec Kieffer, 1906, *Ann. Soc. sci. Brux.* **30** : 319).

I am using this genus in the sense used by Edwards and Goetghebuer. As there is some confusion as to which of the originally included species should be considered as the type of the genus it is probable that the International Commission on Zoological Nomenclature should be asked to pronounce an Opinion placing *Tanypus* on the Official list of generic names.

Wings with macrotrichia on the membrane, costa produced, posterior fork distal to base of M_{3+4}, but this distance less than one-third as long as Cu_1. Pronotum conspicuous, mesonotum without acrostichal bristles but with an oval sharply defined tubercle at the end of the median stripe and immediately before the prescutellar area ; this tubercle is pubescent in the African species. Fourth tarsal segment cylindrical, pulvilli absent. Female antennae 13–15-segmented.

Kieffer and Goetghebuer have described five species and one variety belonging to this genus. I have been able to recognize all of these in the collections at my disposal.

Two of Goetghebuer's species are synonyms of species earlier described by Kieffer, and I have raised the variety to the rank of species; no new species are known to me from Africa.

All the four species which I am recognizing are quite typical members of the genus and resemble *Tanypus punctipennis* Meigen, the Palaearctic species which is the type of the genus according to Edwards.

KEY TO AFRICAN SPECIES OF *Tanypus*

1. Thorax reddish brown dorsally with lateral margins broadly yellow or creamy; female antennae with 13 segments . . . . . *brevipalpis* Kieffer
   Thorax fairly uniformly dark brown or blackish without pale margin . . . 2
2. Wing spots extended and coalesced (Pl. I, fig. d); a small dark species; no row of spots along costa; female antenna with 14 segments . . . . *fuscus* nom. nov.
   Wing spots more discrete; costa with row of spots; female antenna with 15 segments 3
3. Posterior fork cell clear at the base (Pl. I, fig. *b*), r–m usually with slight darkening only . . . . . *guttatipennis* Goetghebuer
   Fork cell clouded basally (Pl. I, fig. *a*), r–m with large cloud . . . *lacustris* Kieffer

Tanypus lacustris Kieffer

Trichotanypus lacustris Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1** : 13.
Tanypus maculosipennis Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25** : 194 (SYN. NOV.).

Wings heavily spotted, tendency for spots to coalesce at level of apex of R_{2+3} and around cross-vein; anterior wing margin with six or seven well marked black spots, posterior fork with spot at base often filling base; palpi short but segments twice as long as broad; thorax brownish black.

This species is very similar to *guttatipennis*, in fact the latter may be only a pale form of it. It seems best separated by the presence of a dark spot at the base of the posterior fork; this spot is variable in size, as are most of the other spots.

Male. Wing length 2·75 mm.

Head brown, mouthparts reduced but larger than in *brevipalpis*; palpi with segments about twice as long as broad; antennae brown, pedicel blackish, A.R. 1·75. *Thorax* brownish black, scutellum paler and with a dark line down its centre, mesonotal stripes indicated by pruinosity. *Legs* pale, femora with two dark rings, one at the apex and one below separated by a pale ring; tibiae dark basally and more narrowly at the apex; each tarsal segment dark at the apex; L.R. 0·8, anterior tarsi bearded. *Wings* with pattern of spots similar to female (Pl. I, fig. *a*), but spots not so large; spots at level of R_{2+3} and r-m have a tendency to fuse or at any rate are larger, costal margin with 6–7 spots, posterior fork with a spot in the basal angle which often includes a pale area. Halteres brown. Abdomen blackish brown, segments paler at their apices.

Female. Similar to the male but wing markings more intense and spots blacker (Pl. I, fig. *a*); antennae with 15 segments.

I have examined the series of cotypes of *T. lacustris* in Muséum National d'Histoire Naturelle, Paris; type locality, KENYA, Naivasha. I have not seen the type of *T. maculosipennis* which is in Musée Royal du Congo Belge.

DISTRIBUTION. UGANDA: 1 ♀, Kampala, 21.v.26 (*G. L. R. Hancock*); 1 ♂, Kampala, 24.xi.27 (*H. Hargreaves*); 4 ♂, 3 ♀, L. Victoria (*W. W. Macdonald*). KENYA: series of cotypes, Naivasha (*Alluaud & Jeannel*); 3 ♂, 2 ♀, Nairobi, vii.1924 (*van Someren*). NIGERIA: 1 ♀, Ibadan, 12.vii.13 (*W. A. Lamborn*). FRENCH W. AFRICA: 1 ♂, Haute Volta, Bobo-Dioulassa, 30.iii.54 (*J. Hamon*). BELGIAN CONGO: 1 ♂, 10 ♀, Kivu, Kalondo, viii.1935 (*H. Damas*). NYASALAND: 1 ♀, Zomba (*H. S. Stannus*). NATAL: 1 ♂, 1 ♀, Bushman's River, Estcourt, 22.ix.53 (*A. D. Harrison*).

Tanypus guttatipennis Goetghebuer

Tanypus guttatipennis Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 354.

This species differs from *T. lacustris* only in the wing markings (Pl. I, fig. *b*). The spots are more discrete and there is less tendency for fusion; those along the costal margin are less dark, there is usually much less darkening around the cross-vein and the base of the posterior fork is quite clear. Goetghebuer is not correct in stating that the tibiae have no dark markings, in fact they resemble *lacustris*. The species may simply be a pale form of *lacustris*.

I have not seen the holotype which is in Musée Royal du Congo Belge (type locality, BELGIAN CONGO, Parc National Albert, Vitshumbi).

DISTRIBUTION. UGANDA: 5 ♂, 6 ♀, L. Victoria, v–vi.52 (*W. W. Macdonald*). BELGIAN CONGO: 6 ♂, 26 ♀, Parc National Albert (*G. F. de Witte & H. Damas*); 1 ♀, Elisabethville, i.1933 (*C. Seydl*). TRANSVAAL: 1 ♀, Harrismith, iii.1927 (*R. E. Turner*); 1 ♂, Johannesburg, iii.1930 (*B. de Meillon*). NATAL: 3♀, Weenen, ix–x.28 (*H. P. Thomasset*). CAPE PROVINCE: 1 ♀, Deelfontein, x.1902 (*Sloggett*); 7 ♀, Ladismith, 4.i.51 (*Swedish S. Afr. Exp.*); 3 ♂, 3 ♀, Tulbagh, 29.x.53 (*K. M. F. Scott*).

Tanypus brevipalpis Kieffer

Protenthes brevipalpis Kieffer, 1923, *Ann. Soc. ent. Fr.* **92**: 187.
Tanypus dewulfi Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 353 (SYN. NOV.).

Easily distinguished from the other African species by the pale reddish brown thorax broadly margined with yellow or yellowish white, and by the complete absence of spots along the costal margin of the wing; mouthparts very short, female antenna with only 13 segments.

Male. Wing length 2–2·5 mm.

Head brown, mouthparts much reduced, palpal segments about as long as wide, pedicel blackish, plumes dark, A.R. 2·5. *Thorax* with pale reddish brown mesonotal stripes which are fused; shoulders and lateral margins broadly margined with yellow or yellowish white; upper half of pleura whitish, lower half and postnotum dark brown. *Legs* with markings very similar to *lacustris* but dark markings on femora and tibiae much less distinct. *Wings* with dark spots arranged as in female (Pl. I, fig. *c*), but spots variable and tend to be smaller in the male; costal margin always lacking spots except for a slight darkening at the apex of R_1, usually clearer than in the female; r-m cross-vein with slight clouding, posterior fork more or less

as shown for female. Halteres with dark knobs. *Abdomen* uniformly blackish brown.

Female. Resembles male in body colour and legs ; wings as in Pl. I, fig. *c*, exact size of spots somewhat variable, especially the double row in cell R_{4+5}. Antennae with only 13 segments.

I have not seen the type of either *brevipalpis* which seems to be lost (type locality, A.E. SUDAN, Shambe), or of *dewulfi* which is in Musée Royal du Congo Belge (type locality, BELGIAN CONGO, Parc National Albert, Vitshumbi).

DISTRIBUTION. ANGLO-EGYPTIAN SUDAN : 30 ♂, 17 ♀, Yirol ii.54 (*E. T. M. Reid*). BELGIAN CONGO : Parc National Albert, long series of both sexes (*G. F. de Witte & H. Damas*). TANGANYIKA : 5 ♀, Shinyanga (*E. Burtt*).

Tanypus fuscus nom. nov.

Protenthes brevipalpis var. *obscurus* Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 189 (nec *Tanypus obscurus* Macquart, 1926, *Rec. Soc. Sci. Agric. Lille* : 189.

This seems to be a distinct species, not only because of the 14-segmented antennae of the female and dark colour, but also because the central thoracic tubercle is much larger than in the other three species.

Female. Wing length 2·25 mm.

Head dark, mouthparts very short, antennae with 14 segments. *Thorax* blackish brown with some pruinosity, median tubercle unusually large and with a central depression. *Legs* dark, tarsi paler, markings as in *lacustris* but not as easy to distinguish. *Wings* (Pl. I, fig. *c*) with markings basically similar to *brevipalpis* but spots are larger and several have coalesced. Halteres blackish. *Abdomen* black.

Male. Not known.

The type is probably lost. Type locality, ANGLO-EGYPTIAN SUDAN, Shambe.

DISTRIBUTION. ANGLO-EGYPTIAN SUDAN : 1 ♀, Melut, 17.xi.53 (*E. T. M. Reid*).

Genus *COELOTANYPUS* Kieffer

Coelotanypus Kieffer, 1913, *Rec. Ind. Mus.* **9** : 154 ; Edwards, 1931, *Dipt. Pat. S. Chile*, **2** : 237.

Wing membrane bare, posterior fork either opposite base of M_{3+4} or stem only one sixth length of Cu_1, vein R_2 present but not distinctly connected to R_{2+3}. Mesonotum with acrostichal hairs present in the African species ; median stripe with oval tubercle immediately before prescutellar area as in *Tanypus*. Fourth tarsal segment more or less cordiform.

Coelotanypus shows some degree of resemblance to *Tanypus* because of the presence of the median thoracic tubercle and short or missing stem to posterior fork. It is, however, much closer to *Clinotanypus* in its general appearance and structure. Since one species of *Clinotanypus* has now been found with a central thoracic tubercle, it seems that the only difference left is the length of the stem of the posterior fork. The genus is typically Neotropical and Nearctic in distribution, the following species being the only one so far known outside these two Regions. It is, therefore, convenient to leave the two genera distinct for the present.

Coelotanypus africanus sp. n.

Thorax reddish, wings hyaline, posterior fork opposite base of M_{3+4}, legs yellow, tips of tibiae dark, abdomen with segments 1–5 mainly pale in the male.

Male. Wing length 3·25 mm.

Head yellowish brown, very transverse when seen from the front, mouthparts fully developed, antennae brown, plumes pale, A.R. nearly 4. *Thorax* fairly uniformly reddish brown, shoulders creamy, postnotum and prescutellar area darker brown ; acrostichal bristles present, but short and pale, diverging around prescutellar

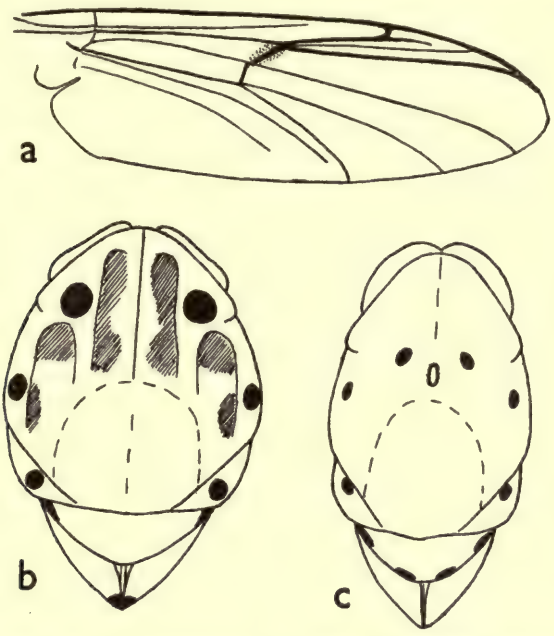

FIG. 12. *Coelotanypus* and *Clinotanypus*. (*a*) wing of female *Coelotanypus africanus* ; (*b*) dorsal view of thorax of a typical male *Clinotanyups claripennis*; (*c*) the same of female *Cl. maculatus*.

area, which is sharply marked off and sunken. *Legs* yellow, tips of tibiae darkened, tarsal segments 3–5 brown, segment 4 bilobed and more or less heart-shaped, pulvilli absent. *Wings* quite clear and unmarked except for a slight darkening at r-m cross-vein, veins otherwise pale ; R_{2+3} distinct (Text-fig. 12, *a*), R_2 present, but disconnected basally, costa produced, r-m cross-vein rather long, base of M_{3+4} slightly basal to it, posterior fork exactly opposite base of M_{3+4}. Halteres yellow. *Abdomen* with segments 1–5 pale, yellowish, segments 3–5 with basal halves brown, segments 6–7 brown, 8 paler.

Female. Quite similar to male but more uniformly yellowish brown, darker thoracic markings much more restricted, abdomen yellowish brown with pale margins to segments. Antennae with 14 segments.

Holotype male, SIERRA LEONE, Batkanu, 21.ii.11 (*H. E. Arbuckle*) in British

Museum. Paratypes: NIGERIA: 1 ♂, Cameroons, Johann Albrechtshöhe, 15.iv.96 (*L. Conradt*). FRENCH CAMEROONS: 1 ♀, Mao Godi, vi.1909 (Riggenbach). Both paratypes are in Zoologisches Museum der Universität, Berlin.

Genus *CLINOTANYPUS* Kieffer

Clinotanypus Kieffer, 1913, *Rec. Ind. Mus.* **9**: 157; Kieffer, 1923, *Ann. Soc. ent. Fr.* **92**: 186; Edwards, 1929, *Trans. ent. Soc. Lond.* **77**: 302; Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 351.

Wings bare, costa produced, R_2 present but disconnected basally and appearing as a free branch of R_1, posterior fork distal to true base of M_{3+4}. Female antennae with 14 segments (Kieffer states 13-segmented in *C. claripennis q.v.*). Fourth tarsal segment bilobed and cordiform.

Four species belonging to this genus have been described by Kieffer and Goetghebuer, but all of them appear to be descriptions of the same species.

Kieffer originally separated *Coelotanypus* and *Clinotanypus* by the presence or absence of a stem to the posterior fork. Edwards (1931) further separated them by the presence or absence of a median mesonotal tubercle. However this tubercle is present in the African species *Clinotanypus maculatus* which has a stalked fork. The two genera are obviously very closely allied, but as stated under *Coelotanypus*, it is convenient to keep them separate until more species have been described and the limits and distribution of the genera more fully explored.

KEY TO AFRICAN SPECIES OF *Clinotanypus*

1. Mesonotum mainly black and without separate stripes 2
   Mesonotum with yellow or reddish background, with or without dark markings, stripes separate 3
2. Wings without well developed clouds; acrostichal and dorso-central bristles and their pits small and inconspicuous . . . . . *lacteus* sp. n.
   Wings with brown markings; thoracic bristles arising from large pits, giving surface a rugose appearance, especially in prescutellar area . . . . *rugosus* sp. n.
3. Acrostichal and dorso-central bristles small, pale and inconspicuous, no median mesonotal tubercle, female thorax without black markings . . *claripennis* Kieffer
   Bristles strong, dark brown and very distinct, median tubercle present, thorax in both sexes with ten black spots arranged in a circle around the prescutellar area *maculatus* Freeman

Clinotanypus claripennis Kieffer

Clinotanypus claripennis Kieffer, 1918, *Ann. Mus. Nat. Hung.* **16**, 63.
Clinotanypus niligenus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92**: 186 (SYN. NOV.).
Clinotanypus nigripalpis Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 351.
Clinotanypus nigrovittatus Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**: 352.

A common and variable species, which seems to occur over most of Africa south of the Sahara, except in the Guinean Forest, and also northwards into Israel. The important features which distinguish the male from the other species are the four round black spots in front of and at the side of the lateral stripes; the stripes in this sex vary from almost entirely black to yellowish, the abdomen is yellow with black

transverse markings, legs yellow with a variable amount of darkening. The female is a large stout insect for the subfamily, with red thoracic stripes, dark abdomen and 14-segmented antennae.

In his description of *C. claripennis*, Kieffer says that the antennae are 13-segmented, but an examination of a female cotype kindly lent by Dr. Mihalyi shows there to be 14 segments present, and enables me to synonymize the later names.

Male. Wing length 2·5–4·0 mm.

Head yellowish, very transverse (Text-fig. 1, *a*), mouthparts fully developed, palpi brown, antennae brown, A.R. about 3·5. *Thorax* with yellow or creamy background; stripes reddish with a variable amount of black (Text-fig. 12, *b*), black markings especially prominent at posterior end of median stripe and anterior ends of lateral stripes, sometimes stripes almost completely black; in addition there are circular black spots on the shoulders, laterally and above the wing base. Basal angles of scutellum and apex of postnotum usually black; postnotum and sternopleuron may be mainly black. Acrostichal and dorso-central bristles small and inconspicuous, median tubercle absent, acrostichal bristles traversing prescutellar area. *Legs* variable in colour; in dark specimens femora and tibiae brown, tibiae with a paler band in apical half, tarsi yellow, segments 2–5 of anterior legs and 3 or 4–5 of posterior legs brown; in pale specimens, legs yellow with tips of tibiae and segments 4–5 of tarsi darkened. *Wings* (Pl. I, fig. *e* of female) hyaline and with a circular cloud over r-m cross-vein, venation normal. Halteres yellowish or brownish. *Abdomen* yellow, segment 1 with slight darkenings laterally, segments 2, 3 and 4 with median transverse narrow dark bands and basal triangular dark spots, segments 5–8 with apical, dark, transverse bands.

Female. Rather different in appearance from male. *Head* (Text-fig. 1, *b*) similarly very transverse, eyes reniform and without such a long dorsal process as in the male, antennae 14-segmented. *Thorax* without black markings, either uniformly reddish, or yellow with reddish or brownish stripes, bristles similarly small, pale and inconspicuous. *Legs* similar to male. *Wings* (Pl. I, fig. *e*) often rather darker, especially anteriorly, but without definite clouds except over r-m. Halteres brown. *Abdomen* stout, uniformly blackish or very dark brown, with pale hairs.

I have been able to borrow a cotype female from the Hungarian National Museum, type locality, Egypt Ismalia. The type of *niligenus* is probably lost, type locality Anglo-Egyptian Sudan, Shambe. I have not seen the types of *nigripalpis* and *nigrovittatus* which are in Musée Royal du Congo Belge (type locality of both, Belgian Congo, Parc National Albert, Vitshumbi).

Distribution. Israel: 2 ♂, Galilee (*O. Theodor*). Anglo-Egyptian Sudan: 10 ♀, between Tonga and Shambe, xi.1953 and 2 ♂, 2 ♀, Yirol, iii.1954 (*E. T. M. Reid*). French Sudan: 2 ♂, Macina. Nigeria: 1 ♀, Afikpo, 2.vi.10 (*J. J. Simpson*); 1 ♂, Gadau, 18.iii.33 (*D. J. Lewis*). Uganda: 1 ♂, Nambadyidza Forest, 24.xi.29 (*G. H. E. Hopkins*); 1 ♀, Entebbe, 13.xii.34 (*F. W. Edwards*); 2 ♂, L. Victoria, 7.viii.51 (*W. W. Macdonald*). Kenya: 3 ♀, Kisumu, 5.vii.35 (*C. B. Symes*). Belgian Congo: 2 ♀, Ituri (*A. Collart*); 1 ♀, Mulongo (Mafinge), vii.1930 (*P. Gérard*); 11 ♀, Musosa, ix–xi.39 (*H. Brédo*); long series of both sexes from Parcs Nationaux Albert and Upemba. Nyasaland: 1 ♂, Luchenza, Makandi,

14.v.11 (*F. G. Evans*) ; 1 ♀, Langenburg. N. RHODESIA : series of 30 damaged specimens, Lake Bangweulu, ix–xii.46 (*M. Steele*). S. W. AFRICA : 5 ♀, Kaokoveldt, Ohopoho, vi.51 (*Swedish S. Afr. Exp.*). ORANGE FREE STATE : 1 ♂, 1 ♀, Harrismith ii–iii.27 (*R. E. Turner*). NATAL : 1 ♂, iii–iv.24 and 2 ♀, ix–x.28 (*H. P. Thomasset*).

Clinotanypus maculatus Freeman

Clinotanypus maculatus Freeman, 1955, *Explor. Parc Nat. Upemba*, Miss. G. F. de Witte, fasc. 35 : 92.

A yellow insect with 10 small black spots on the thorax forming a circle around the prescutellar area. Easily separated from *C. claripennis* by the thoracic pattern, by the stronger and darker thoracic bristles and by the presence of a central oval mesonotal tubercle.

Male. Wing length 2·5 mm.

Head yellow, eyes with narrow dorsal portions, palpi brown; antennae yellowish brown, A.R. nearly 4, plumes yellow on basal two thirds, grey on apical third. *Thorax* with reddish yellow stripes on a whitish yellow background, bristles numerous and black, stronger then in *claripennis*, postnotum and sternopleuron reddish yellow ; central mesonotal tubercle present, as in *Coelotanypus*, bearing a small tuft of black bristles. There are 10 small round black spots (Text-fig. 12, *c* of female) arranged as follows : four in an arc across middle of mesonotum, one above each wing base, one at each lateral angle of scutellum and two close together at apex of scutellum ; seen from above the spots are in a circle enclosing the prescutellar area. *Legs* pale, whitish yellow, tips of anterior femora, tips of all tibiae, tips of basal three tarsal segments, and whole of tarsal segments 4 and 5, dark. *Wings* quite hyaline, except for a blackened cross-vein, venation normal, halteres pale. *Abdomen* yellow and with three longitudinal rows of small black spots, one placed centrally and one along each lateral margin ; all spots near bases of segments, central ones the larger ; spots best developed on segments 3–6, more or less obsolete on others. Abdominal hairs pale, except on spots where they may be darker.

Female. Wing length 2·5–2·75 mm.

Very similar to male (Text-fig. 12, *c* of thorax), thoracic background less white, so stripes less distinct, abdominal spots may be obsolete in some specimens.

Holotype female, in collections of the Institut des Parcs Nationaux du Congo Belge.

DISTRIBUTION. BELGIAN CONGO : 1 ♀, Lac Upemba, Mabwe, viii.47 (*G. F. de Witte*)—holotype ; 1 ♀, Stanleyville, vii.1928 (*A. Collart*)—paratype. DAHOMEY : 3 ♂, 2♀, Porto Novo, Tove, xii.1954 (*J. Hamon*).

Clinotanypus lacteus sp. n.

A blackish species with prothorax and pleural membrane of male milk white, of female shimmering; mesonotum shining and without tubercle, bristles and their pits small and inconspicuous ; wings clear.

Male. Wing length 3·0 mm.

Head brown, mouthparts normal, palpi dark, antennae brown, plumes blackish, A.R. about 2·5. *Thorax* with shining black mesonotum; shoulders with diagonal yellow markings, stripes just indicated by browner areas along lines of bristles which are small, pale and inconspicuous, pits also small; prothorax and pleural membrane strikingly milk white, scutellum, postnotum and sternopleuron black; no sign of a median tubercle. *Legs*: in the holotype, basal third of femora yellowish, remainder black; tibiae black, middle and posterior ones with a broad median brown area; tarsi black, basitarsus mainly whitish; in the paratype male, femora only darkened apically. *Wings* clear and unclouded except for a slight smokiness towards the costa. Halteres with yellow knobs and darker stems. *Abdomen* black and with mainly black hairs, segments 1–5 with brown or yellowish areas each side at the base, hypopygium brown or yellow.

Female. Quite similar to male, thorax shining, stripes better indicated, bristles and pits inconspicuous; prothorax and pleural membrane shimmering only, not milk white. Antennae with 14 segments; legs mainly dark, basitarsus mainly whitish.

Holotype male, BELGIAN CONGO, Ruanda Urundi (*J. Schwetz*) in British Museum. Paratypes: 1 ♂, NIGERIA, Oshogbu, 11.x.10; 1 ♀, HAUTE VOLTA, Guena Bobo, 26.vi.53 (*J. Hamon*).

Clinotanypus rugosus sp. n.

Distinguished from the female of *C. lacteus* by the large size of the pits of the mesonotal bristles, by the presence of definite wing markings and by the rather different leg markings.

Female. Wing length 2·0 mm.

Head brown, palpi darker, antennae pale, with 14 segments. *Thorax*: mesonotum black, not so strongly shining as in *lacteus*, shoulders hardly paler, bristles small and pale, but their pits very large, giving shoulders and scutellar area a rugose appearance; prothorax and pleural membrane with a greyish shimmer, probably due to the microtrichia; scutellum, postnotum and sternopleuron black. *Legs* black and white; femora black; tibiae black, anterior pair white on apical half, posterior pair with a white ring just below the middle; anterior tarsi black with basitarsus mainly white, other tarsi white except for segments 4 and 5. *Wings* (Pl. I, fig. *f*) mainly dark but with tips clear. Halteres dark. *Abdomen* blackish brown, paler beneath, hairs pale.

Male not known.

Holotype female, SIERRA LEONE, Njala, 21.vi.32 (*E. Hargreaves*) in British Museum. Paratypes, 1 ♀, NIGERIA, Zungeru, 15.xi.10 (*J. W. S. Macfie*). SUDAN: 1 ♀, Amadi, vi.54 (*E. T. M. Reid*).

There is a single female in the collections of Institut des Parcs Nationaux du Congo Belge from Parc National Albert which may belong to this species, but the apex of the wing in slightly clouded and there is a subapical darker area. It is possible that the wing markings are variable.

Genus ***PROCLADIUS*** Skuse

Procladius Skuse, 1889, *Proc. Linn. Soc. N. S. Wales* (2) **4** : 283 ; Edwards, 1929, *Trans. ent. Soc. Lond.* **77** : 300.
Trichotanypus Kieffer, 1918, *Ann. Mus. nat. Hung.* **16** : 62 ; Kieffer 1923, *Ann. Soc. ent.* **92** : 189 ; Kieffer, 1925, *Bull. Soc. R. ent. Egypte*, **1924** : 309 ; Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 355 (nec Kieffer, 1906, *Ann. Soc. sci. Brux.* **30** : 319—see Podominae).
Psilotanypus Kieffer, 1906, *Genera Insect.* **42** : 34.

I am following Edwards (1929) in his use of this genus to include both hairy and bare winged species. Those with macrotrichia on the membrane are placed in the subgenus *Procladius* sens. str., those with bare membrane are placed in *Psilotanypus*. I have material of six species including one of *Psilotanypus*.

The genus may be defined : Wings hairy or bare, costa produced, R_2 present and very distinct, stem of posterior fork more than half as long as Cu_1. Female antenna with 13–14 segments. Pronotum well developed, hairy above. Fourth tarsal segment on all legs cylindrical, no pulvilli.

Kieffer and Goetghebuer have described seven species between them, but several of these appear to be synonyms. Five of the species are clear cut but the sixth may be a complex of two or more closely allied species. It is variable in size, colour and hairiness and seems to represent the Palaearctic species *P. choreus* Meigen. I am using the first name applied to it by Goetghebuer (*brevipetiolatus*), but it is quite possible that further collecting will show that two or more species are present.

Key to African Species of *Procladius*

1. Wing membrane lacking macrotrichia (subg. *Psilotanypus*) . . . . . *reidi* sp. n.
   Wing membrane with macrotrichia, at least apically (subg. *Procladius*) 2
2. General body colour blackish brown 3
   General body colour yellowish or pale brown 5
3. Macrotrichia confined to a triangular area at the apex of cell R_{4+5} . . *apicalis* Kieffer
   Macrotrichia present over most of wing surface 4
4. Basitarsus white, wings with pattern of scale-like macrotrichia . . *albitalus* sp. n.
   Basitarsus and tibiae yellowish brown, wings usually with an apical or subapical shadow but without scale pattern . . . . . *brevipetiolatus* Goetghebuer
5. Wings with subapical transverse row of spots (Pl. I, fig. k) . . . *maculosus* sp. n.
   Wings with subapical dark shadow 6
6. Wings with a black spot over R_2 (Pl. I, fig. *j*) . . . . . *polytomus* Kieffer
   Wings without this spot (Pl. I, fig. *i*) . . . . . *noctivagus* Kieffer

Procladius (Procladius) brevipetiolatus Goetghebuer

Trichotanypus brevipetiolatus Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 355 ; Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22** : 129.
Trichotanypus umbrosus Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27** : 356 (SYN. NOV.).

Goetghebuer separated his two species mainly on two characters, firstly on the presence of a dark shadow on the wing of *umbrosus* and secondly on the shorter stem to the posterior fork of *brevipetiolatus*. Whilst it is possible to find specimens to fit these two extremes, there is so much variability in size, colour, and hairiness that I have found it impossible to maintain the distinction. There are series in the British

Museum of larger specimens with wings densely clothed with dark macrotrichia ; in these the wing membrane is nearly clear, but there are traces of brown staining which can be found by varying the light. There is a complete gradation from such specimens to others with quite heavily marked wings and small in size.

This species seems to be the African representative of *P. choreus* Meigen from which it can be separated by the much smaller outer lobe of the male style.

Male. Wing length 2·0–3·0 mm.

Head brown, pedicel and palpi darker, A.R. about 2. *Thorax* with dark grey or blackish stripes separated by pruinosity along the lines of the dorso-central bristles and in the prescutellar area ; shoulders, pleural membrane and scutellum yellow or brownish, postnotum and sternopleuron dark. *Legs* brownish yellow, femora may be darker ; tips of tibiae and segments 2–5 of tarsi dark ; L.R. 0·75.

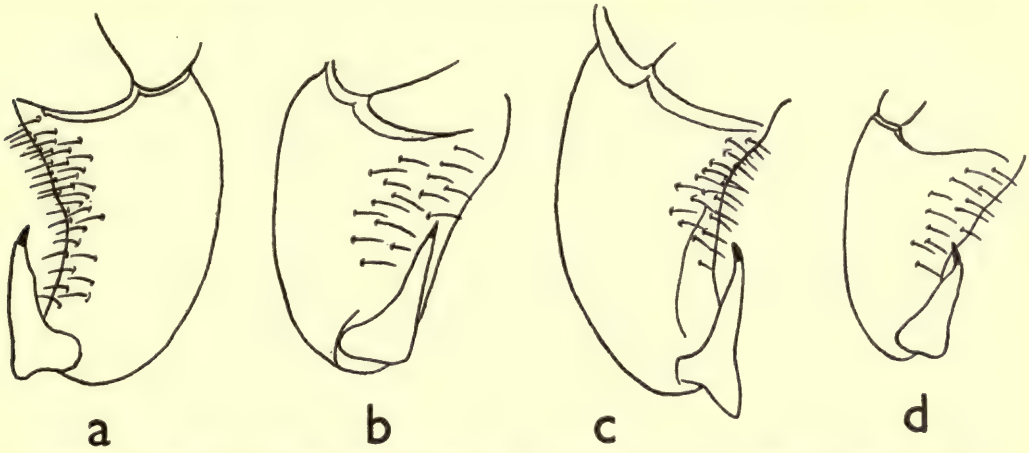

FIG. 13. Male hypopygia of *Procladius*. (*a*) *P. brevipetiolatus* ; (*b*) *P. albitalus* ; (*c*) *P. noctivagus* ; (*d*) *P. polytomus*.

Wings with normal venation as in Pl. I, fig. *g* of female ; membrane thickly clothed with macrotrichia, which may be all dark and then the membrane is hardly stained beneath, or the membrane may show staining as in the figure with dark macrotrichia over the staining and pale macrotrichia elsewhere ; cross-vein always clouded. Halteres usually yellow, occasionally brown. *Abdomen* dark brown with pale apical bands on segments 1–5 ; pale bands may occupy one third or one half of segments. Hypopygium (Text-fig. 13, *a*) with simple style, outer lobe short ; style variable in exact shape, may be broader than shown.

Female. Very similar to male. Antennae with 13 segments, though basal flagellar segment sometimes indistinctly divided. Wings more thickly clothed with macrotrichia, staining usually visible and darker than in the male. Abdomen with narrow pale rings apically on segments 1–7.

I have not seen the type specimens of either of Goetghebuer's species which are in Musée Royal du Congo Belge. Type locality of *brevipetiolatus*, BELGIAN CONGO, Parc National Albert, Vitshumbi ; of *umbrosus*, BELGIAN CONGO, Cratère Muyunga.

DISTRIBUTION. UGANDA: Entebbe, numerous specimens of both sexes, viii.51 (*W. W. Macdonald*); 1 ♂, Bwamba, Hakitengya, iv.1948 (*W. R. Lumsden*). KENYA: 3 ♂, 2 ♀, Nairobi (*van Someren*); 3 ♀, Kabete, xi.1913 (*T. J. Anderson*); 1 ♂, Naivasha, 4.v.18 (*T. J. Anderson*); 1 ♂, Kiambu, i.1933 (*Symes & Hopkins*); 4 ♂, 1 ♀, Kisumu (*C. B. Symes*). BELGIAN CONGO: numerous specimens from Parc National Albert (*de Witte & Damas*). NYASALAND: 1 ♂, Dowa Distr. (*J. B. Davey*). BECHUANALAND: 4 ♂, 34 ♀, Kalahari, Gemsbok Park, 16.xi.50 (*Swedish S. Afr. Exp.*). S. W. AFRICA: 1 ♂, 2 ♀, Kaokoveldt, Ohopoho, 4.vi.51 (*Swedish S. Afr. Exp.*). NATAL: 1 ♀, Weenen ix–x.28 (*H. P. Thomasset*); 1 ♀, Eshowe, ix.1930 and 2 ♂, 2 ♀, iii–iv.35 (*B. de Meillon*); 3 ♂, 3 ♀, Newcastle, ix.1953 (*A. D. Harrison*). CAPE PROVINCE: numerous specimens, Berg River (*K. M. F. Scott*); 1 ♀, Ceres, iii.1935 (*R. E. Turner*).

Procladius (Procladius) apicalis Kieffer

Trichotanypus apicalis Kieffer, 1918, *Ann. Mus. nat. Hung.* **16**: 62.

This species was described from two males from Pretoria, Natal. I have seen material agreeing with the description and have been able to borrow a cotype from Hungarian National Museum.

In general appearance, colour and structure, it is very similar to *P. brevipetiolatus*. It differs by A.R. being nearer 1·0, the wings lacking a sub-apical shadow and by the macrotrichia in the male being present only as a triangular patch at the apex of cell R_{4+5}; the cross-vein is darkened. In the female, the macrotrichia are more extensive and are present at the apices of cells R_{4+5}, M_1, M_4 and anal cell.

DISTRIBUTION. TRANSVAAL: Pretoria (type series); 2 ♂, 5 ♀, Olifantsvlei, viii.54 (*A. D. Harrison*); 1 ♂, 3 ♀, Benoni, viii.54 (*A. D. Harrison*). ANGLO-EGYPTIAN SUDAN: 1 ♂, Amadi, vi.vii.54 (*E. T. M. Reid*).

Procladius (Procladius) albitalus sp. n.

Black, pleura with grey "bloom"; easily distinguished from the other species by the black legs with white basitarsus and wings with two transverse patches of scale-like macrotrichia.

Male. Wing length 1·5–2·25 mm.

Head and pedicel yellowish brown, mouthparts black, flagellum and plumes black, A.R. 1·3. *Thorax* black or blackish brown, mesonotum shining, pleura with grey "bloom" having a slightly different appearance from the pruinosity so common on Chironomid thoraces. *Legs* black, basitarsi white, L.R. 1·4; tibiae rather thickly clothed with black hairs, anterior tarsi without beard. *Wings* (Pl. I, fig. *h* of female) with normal venation, macrotrichia not uniformly distributed; normal macrotrichia present at apex and round the margin; rather broader, blacker, almost scale-like macrotrichia forming two incomplete transverse bands one at the level of the cross-vein and which expands in the anal cell, and one at the level of R_2, this band only reaches M_{3+4}; veins also scaly. Halteres black. *Abdomen* black with well developed

black hairs. Hypopygium (Text-fig. 13, *b*) with simple styles which lack outer lobes.

Female. Similar to the male except that the wings have rather more macrotrichia (Pl. I, fig. *h*) ; antennae with 14 segments.

Holotype male, UGANDA, Kampala, 21.viii.26 (*G L. R. Hancock*) in British Museum.

DISTRIBUTION of paratypes. KENYA : 2 ♀, Nairobi, ii.1924 (*van Someren*). FRENCH W. AFRICA : 2 ♂, 1 ♀, Upper Volta, Bobo Dioulasso, 21.viii.53 (*J. Hamon*). TRANSVAAL : 4 ♀, Tzaneen, 1.viii.32 (*B. de Meillon*). NATAL : 1 ♀, Eshowe, ix.1930 (*B. de Meillon*).

Procladius (Procladius) noctivagus Kieffer

Tanypus noctivagus Kieffer, 1910, *Mem. Ind. Mus.* **2** : 222.
Trichotanypus niloticus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92** : 189 (SYN. NOV.).
Trichotanypus nilicola Kieffer, 1925, *Bull. Soc. R. ent. Egypte*, **1924** : 309 (SYN. NOV.).

The type of *T. noctivagus* is a female and is in the British Museum ; it is clearly the same species as Kieffer later described under the name *nilicola*. He described the colour as " roux carné," whereas in fact it is yellowish with brown mesonotal stripes postnotum and sternopleuron ; he also omitted to mention the dark cloud in the anal cell. In his key he states that the mesonotum is without bands. The specimen is certainly the true type because the mounting and labelling are the same as for other species from the same collection.

The description of *T. niloticus* agrees very well with the same species except that he states that the wings are hyaline. If he can describe *noctivagus* as being without mesonotal stripes, it would be quite easy for him not to notice the wing markings as they are often quite faint and depend a good deal on the lighting.

P. noctivagus is a much paler species than *brevipetiolatus*, and is mainly yellow with brown thoracic markings ; wings with similar dark markings, but styles with longer outer lobe.

Male. Wing length 2–2·25 mm.

Head yellowish brown, palpi dark brown, pedicel reddish brown, A.R. nearly 2. *Thorax* with yellowish background and brown stripes ; prescutellar area yellowish, postnotum and sternopleuron brown. *Legs* yellow, apices of segments narrowly darker, anterior tarsi bearded, L.R. 0·75. *Wings* hairy, very similar to the darker forms of *brevipetiolatus* (See Pl. I, fig. *i* of female) ; cross-vein clouded, dark staining as a broad subapical band and an anal spot, both clothed with darker macrotrichia. Halteres whitish. *Abdomen* mainly yellow, segments each with a narrow basal dark band. Hypopygium (Text-fig. 13, *c*) with outer lobe of style longer than in *brevipetiolatus*.

Female. Closely resembles male ; antennae with 13 segments ; thoracic stripes more clear cut, abdomen almost completely yellow, wing markings more distinct (Pl. I, fig. *i*).

Holotype of *T. noctivagus* a female, in the British Museum, type locality,

EGYPT, Suez Canal. The types of *niloticus* (locality, ANGLO-EGYPTIAN SUDAN, S. of Khartoum) and *nilicola* (locality, EGYPT, Maadi) are probably both lost.

DISTRIBUTION. EGYPT: 2 ♀, Moascar, iii.1942 (*S. H. Segerman*). ANGLO-EGYPTIAN SUDAN: 8 ♂, 8 ♀, Meroe nr. Assuan (*S. Hirst*); 1 ♀, Alaki, 20.i.23 (*S. Hirst*); 1 ♂, Halfa (*S. Hirst*); 1 ♀, Khartoum, i.1923 (*S. Hirst*); 2 ♂, 1 ♀, ii.1952 and 8 ♂, 1 ♀, 24.i.53, Khartoum (*D. J. Lewis*).

Procladius (Procladius) polytomus Kieffer

Trichotanypus polytomus Kieffer, 1923, *Ann. Soc. ent. Fr.* **92**: 190.

In his original description Kieffer states that the female antennae are 15-segmented. I have a series from the southern Sudan near the type locality, closely agreeing in wing markings and colouration with his specimens, but with only 13 segments to the female antenna. I am assuming that either Kieffer made a mistake or else the female he studied was aberrant.

It is a small pale brown species, distinguished from similar pale species by the black spot at the apex of R_1.

Male. Wing length 1·5 mm.

Head yellow, palpi dark, pedicel brown, flagellum and plumes pale, A.R. nearly 2. *Thorax* with yellowish background; mesonotal stripes, postnotum and sternopleuron brown. *Legs* very pale, translucent, apices of segments narrowly darkened, L.R. 1·5. *Wings* (see Pl. I, fig. *j* of female) with normal venation; cross-vein, base of M_{3+4} and apex of R_1 with dark spots; in addition there are four dark shades as follows: a large transverse one at the level of apex of R_1 reaching from R_{4+5} to M_{3+4}, a small one at apex of cell R_{4+5}, one filling posterior fork and a fourth in the anal cell. Macrotrichia present over apical third of wing and round into anal cell. Halteres white. *Abdomen* brown, segments 1–4 with yellow bands occupying their apical halves, remaining segments narrowly pale apically. Hypopygium (Text-fig. 13, *d*) with simple styles, apical spine rather long.

Female. Quite similar to male, macrotrichia more densely arranged on wing (Pl. I, fig. *j*); abdomen brown, each segment with narrow pale apex, antennae 13-segmented in all specimens I have seen (Kieffer states antennae of type are 15-segmented).

The holotype, a female from ANGLO-EGYPTIAN SUDAN, Shambe, is probably lost.

DISTRIBUTION: ANGLO-EGYPTIAN SUDAN: 4 ♂, 7 ♀, Yirol, 28.iii.54 and 1 ♀, Adok, 21.xi.53 (E. T. M. Reid).

Procladius (Procladius) maculosus sp. n.

A very small species, white with yellowish mesonotal stripes, distinguished from all other African species by the two transverse rows of spots on the wings.

Female. Wing length 1·5 mm.

Head chalk white, palpi dark, antennae broken, but pedicel white. *Thorax* white, stripes separate, yellowish brown, postnotum and sternopleuron tinged with yellow. *Legs* translucent white, tips of tibiae slightly darkened, tarsi broken.

Wings (Pl. I, fig. *k*) with normal venation ; dark markings in the form of two transverse rows of four spots, one row at the level of the cross-vein, the other at the level of R_2 ; macrotrichia sparse, mostly in the apical third of the wing, but there are a few in the anal cell. Halteres white. *Abdomen* white, segments 1–5 faintly tinged with yellowish green at their bases.

Male. Not known.

Holotype female, ANGLO-EGYPTIAN SUDAN, Melut, 17.xi.53 (*E. T. M. Reid*) in British Museum.

Procladius (Psilotanypus) reidi sp. n.

This is the only bare winged species of the genus known to me from Africa ; none has been described previously.

It is a distinctive species with white body colour, yellowish or reddish brown mesonotal stripes and a black median abdominal stripe ; wings clear but with a small brown spot over r-m cross-vein.

Female. Wing length 1·5 mm.

Head white, palpi dark, antennae of all specimens broken (holotype has 11 segments left), pedicel white and flagellum slightly darker, flagellar segments moniliform. *Thorax* white ; mesonotal stripes yellowish brown or reddish brown, outer margins dark brown, fused across, but prescutellar area white ; lateral stripes carried backwards on to outer angles of scutellum which is otherwise white ; postnotum black, sternopleuron pale yellowish. *Legs* white, tarsal segments 3–5 black, L.R. 1·5. *Wings* clear and hyaline (Pl. I, fig. *l*), veins colourless, the only markings being a rounded, dark brown spot over r-m cross-vein, venation normal ; membrane without any sign of macrotrichia even at the tip (I have examined a stained wing under high power for the macrotrichial pits and found none). Halteres white. *Abdomen* white, with a median longitudinal black stripe which is slightly wider on segment 4.

Male. Not known.

Holotype female, ANGLO-EGYPTIAN SUDAN, Adok, 21.xi.53 (*E. T. M. Reid*), in the British Museum.

Paratypes. ANGLO-EGYPTIAN SUDAN : 8 ♀, Melut, 17.xi.53 (*E. T. M. Reid*).

Subfamily ***DIAMESINAE***

The Diamesinae occupy a position intermediate between the Tanypodinae and Orthocladiinae. The following is a definition of the subfamily.

Base of M_{3+4} present; R_{2+3} present and distinct, ending in costa well beyond R_1 to which it is not connected; R_2 absent. Male antenna usually with 13–14 segments, but may be reduced to as few as six ; there are traces of a fifteenth segment in *Protanypus*. Female antenna with 6–8 segments, except in *Protanypus* where there are 14. Pronotum well developed, divided in the middle only in *Heptagyia*.

Only one species, belonging to *Diamesa*, is known to me from Africa south of the Sahara ; there are none described by earlier authors. In a previous paper I referred to a second species, but the material was in extremely poor condition, and on a re-examination I have decided that it does not belong to this subfamily. It is possible

that more species will be found in the mountainous parts of East, Central and Southern Africa, and I am therefore giving a key to the genera.

The latest Revision of the subfamily is that of Pagast (1947, *Arch. Hydrobiol.* **41** : 435–596). He recognizes 12 genera, five of them new, including one described from early stages only. I am treating his new genus *Sympotthastia* as a subgenus of *Pseudodiamesa*, and his genus *Onychodiamesa* together with *Potthastia* as subgenera or synonyms of *Diamesa*.

Edwards (1929) divided *Syndiamesa* from *Diamesa* by the shape of the fourth tarsal segment, a character which was not always easy to appreciate. Pagast uses as characters in generic definition the condition of the dorso-central hairs and the dorsal narrow parts of the eyes, which are easier to use. However, the type species of *Syndiamesa* (*hygropetrica* Kieffer) now falls into *Diamesa* so that *Syndiamesa* can no longer stand.

KEY TO GENERA OF DIAMESINAE

1. Pronotum with two forward projecting lobes ; mesonotum thickly covered with hair, except on the stripes . . . . . *Lobodiamesa* Pagast
   Pronotum simple ; mesonotum with hair in the usual three rows only . . . 2
2. Dorso-central hairs absent, or very short and decumbent, not arising from distinct pits *Heptagyia* Philippi
   Dorso-central hairs long, suberect, and arising from distinct pits 3
3. Base of M_{3+4} basal to posterior fork 4
   Base of M_{3+4} beyond posterior fork 6
4. Eyes hairy ; fourth tarsal segment heart-shaped . . . . *Maoridiamesa* Pagast
   Eyes bare ; fourth tarsal segment cylindrical 5
5. Eyes with narrow dorsal part ; second palp segment simple . . *Prodiamesa* Kieffer
   Eyes lacking narrow dorsal part ; second palp segment toothed . *Odontomesa* Pagast
6. Pronotum hairy all over ; antennae of female 14-segmented . . *Protanypus* Kieffer
   Pronotum bare above ; antennae of female with 6–8 segments 7
7. Dorso-central bristles bi- or tri-serial ; eyes with dorsal narrower portion *Pseudodiamesa* Goetghebuer
   Dorso-central bristles uniserial, at least anteriorly ; eyes not narrowed above *Diamesa* Meigen

Genus ***DIAMESA*** Meigen

Diamesa Meigen, 1838, *Syst. Beschr. Zweifl. Insekt.* **7** : 12 ; Edwards, 1929, *Trans. ent. Soc. Lond.* **77** : 304 ; Pagast, 1947, *Arch. Hydrobiol.* **41** : 462.
Syndiamesa Kieffer, 1918, *Ent. Mitt.* **7** : 101 ; Edwards, 1929, *Ibid.* **77** : 303.

Eyes pubescent or bare, narrow dorsal part not developed. Antenna of female with 7–8 segments ; of male, when fully developed, without trace of fifteenth segment. Pronotum bare or only slightly hairy at sides ; dorso-central bristles uniserial, long and suberect, arising from distinct pits. Male styles simple, tip of coxites not prolonged. Fourth tarsal segment, at least on posterior legs, shorter than fifth and more or less cordiform or bilobed at tip. Base of M_{3+4} a little distal to posterior fork.

Diamesa (Diamesa) ruwenzoriensis sp. n.

This species belongs to *Diamesa* in its strictest sense ; the female is very similar to the Palaearctic species *D. culicoides* Heeger, but can be distinguished by the 7-

segmented antennae and brownish wings. The male is a distinctive insect with short 7-segmented antennae similar to those of the female ; the hypopygium has only a minute anal point. It is improbable that the males are intersexes (see under " Variation and Differences between the Sexes "), because the two collections were made on quite different occasions; there are species known from other Regions with reduced antennae in the male.

Male. Wing length 3·5 mm.

Head black, palpi well developed, eyes kidney-shaped, pubescent, without the narrow dorsal part ; antennae with seven segments, similar to female, segments 3–6 quadrate, segment 2 twice as long as 3, segment 7 nearly three times as long as 6, no plume hairs present. *Thorax* mainly black, with a good deal of grey pruinosity, especially in the holotype; mesonotum with three black stripes, shoulders and lines of dorso-central bristles grey; acrostichal bristles absent, dorso-centrals uniserial,

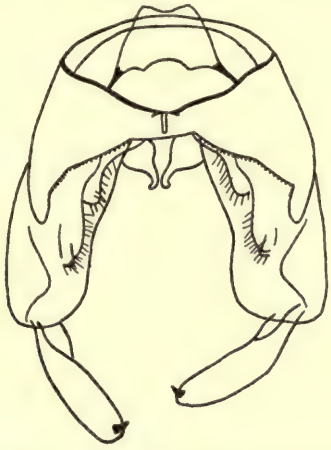

FIG. 14. Male hypopygium of *Diamesa ruwenzoriensis.*

well developed, upright and arising from black pits. *Legs* black, trochanters with a trace of yellow ; L.R. 0·6 ; anterior tarsi not bearded ; fourth tarsal segment on all legs shorter than fifth and slightly cordiform, pulvilli absent, empodium well developed. *Wings* with a brown tinge, veins seamed, very similar to female (Pl. I, fig. *m*) ; microtrichia readily visible under magnification of × 300 ; costal margin sinuous, costa slightly prolonged. Halteres yellow. *Abdomen* black, segments paler along posterior margin, pleural membrane reddish. Hypopygium (Text-fig 14) with IXth tergite widely emarginate, anal point minute ; basal and internal structures as shown ; styles simple, oblong, with short spine at apex.

Female. Wing length 4·0–4·25 mm.

Exactly similar to the male except for the genital structures. Ovipositor lobes moderately developed, cerci small.

Holotype male and paratypes 3 females, UGANDA, Ruwenzori Range, Namwamba Valley, 10,200 ft., x.1934–i.1935 (*F. W. Edwards*) ; 5 ♂, Ruwenzori Range, Lake Bujuku, 13,050 ft., 22–28.vii.1952 (*D. S. Fletcher*), all in British Museum.

SUBFAMILY CLUNIONINAE

For convenience I am dealing with this subfamily here, although their correct place would probably be after the Orthocladiinae. The subfamily may be defined as follows :

Male antennae never plumose, often similar to those of the female. Pronotum completely divided into lateral lobes ; postnotum without distinct furrow ; suture between sternopleuron and anepisternum absent or indistinct (Text-fig. 15). Legs, especially hind pair, usually very long, front coxae enlarged, posterior tibiae without combs. Wings often reduced, venation not unlike Orthocladiinae. Male hypopygium inverted, styles infolded, without distinct terminal spine.

Apart from some *Telmatogeton* species living in moutain streams in Hawaii, all the species are restricted to a marine intertidal habitat. Four species belonging to three genera have been described from S. and E. Africa ; I have material of

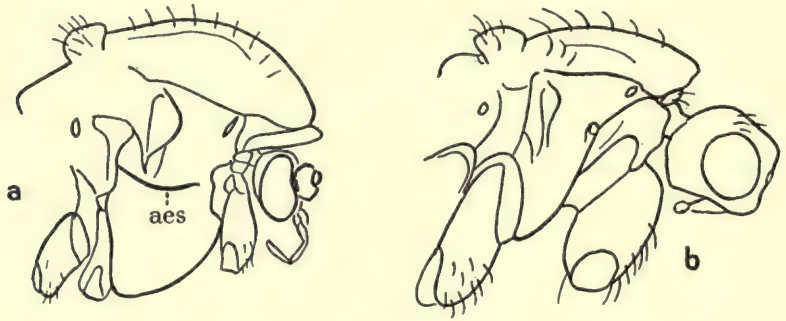

FIG. 15. Side view of thorax of (*a*) an Orthocladiine and (*b*) a Clunionine to show presence of anepisternal suture (*aes*) in the former and its absence in the latter. (From Edwards, 1929).

two of them at my disposal. There are excellent published descriptions of all the species and I am confining my account therefore to the important distinguishing features only.

The following generic key is based on that given by Wirth (1949, *Univ. Calif. Publ. Ent.* **8**, 151–182) and includes all the known genera, not just those so far recorded from Africa.

KEY TO GENERA OF CLUNIONINAE.

1. Second segment of posterior tarsus not longer than third 2
   Second segment of posterior tarsus longer than third 5
2. Second segment of posterior tarsus much shorter than third . . . *Clunio* Haliday
   Second segment of posterior tarsus subequal to third 3
3. Wings straplike, reaching to fourth abdominal segment, halteres present *Eretmoptera* Kellogg
   Wings vestigial not reaching to abdomen, halteres absent 4
4. Palpi short, one-segmented ; antennae seven-segmented . . . *Tethymyia* Wirth
   Palpi and antennae both 4-segmented . . . . . *Belgica* Jacobs

5. Fifth tarsal segment simple or slightly bilobed . . . . . *Thalassomyia* Schiner
   Fifth tarsal segment deeply trilobed at tip 6
6. Both sexes fully winged 7
   Both sexes brachypterous 8
7. Legs unmodified, leg hairs weak . . . . . *Telmatogeton* Schiner
   Front femur of male swollen and with an angular projection near apex interlocking with a basal tibial projection; leg hairs strong, sometimes flattened as appressed scales . . . . . *Paraclunio* Kieffer

8. Wings about as long as thorax, halteres present . . . . *Psammathiomyia* Deby
   Wings and halteres minute or absent . . . . . *Halirytus* Eaton

Genus ***CLUNIO*** Haliday

Clunio Haliday, 1855, *Nat. Hist. Rev.* **2** : 62 ; Edwards, 1929, *Trans. ent. Soc. Lond.* **77** : 370 ; Stone and Wirth, 1947, *Proc. ent. Soc. Washington* **49** : 201–24 ; Wirth, 1949, *Univ. Calif. Publ. Ent.* **8** : 158.

Eyes pubescent ; mouthparts reduced ; male with well developed wings, microtrichia absent ; female lacking wings and halteres ; legs stout, pulvilli absent, empodium as large as claws ; male hypopygium large, at least half total length of abdomen, styles arcuate or triangular in profile.

There is a single African species described by Hesse. The following brief diagnosis is taken from his description.

Clunio africanus Hesse

Clunio africanus Hesse, 1937, *Proc. R. ent. Soc. Lond.* (B) **6** : 165–8 ; Stone and Wirth, 1947, *Proc. ent. Soc. Washington* **49** : 220.

Male. Wing length 2 mm.

General body colour dark brown, pleura and legs rather paler. Pubescence on body scanty, about four setae in front of wing base, about six in each row of dorsocentrals ; leg setae well developed. Interocular space on vertex about half as broad as head across eyes and broader than vertical depth of eyes ; eyes rather large. Antennae 11-segmented, flagellum subequal to middle tibia ; basal flagellar segment elongate, but slightly shorter than segment 11 ; 4–10 moniliform, slightly longer than broad ; segment 11 subequal to the three preceding segments together. Wings with vein Cu gently curved. Styles somewhat flattened and scapuliform, apical angle rounded and with a few minute recurved spines.

Female not known.

Known only from the type series, NATAL, Isipingo, vii.1935.

Genus ***THALASSOMYIA*** Schiner

Thalassomya Schiner, 1856, *Verh. Zool. Bot. Ges. Wien* **6** : 218 ; Wirth, 1949, *Univ. Calif. Publ. Ent.* **8** : 166.

Thalassomyia Schiner, 1868, *Reise Novara, Zool.* **2** : 24 (emend.) ; Edwards, 1926, *Proc. Zool. Soc. Lond.* **51** : 786.

Eyes bare, palpi four segmented, antennae of both sexes similar and with seven segments. Hypopygium very small, legs long, especially the hind pair; third tarsal segment bilobed at tip, fourth short and strongly cordiform, fifth not lobed at tip, empodium very large. Wings fully developed in both sexes, microtrichia present, R_{4+5} curved and reaching almost to wing tip, squama fringed.

The following East African species is known also from the Marquesas Islands.

Thalassomyia africana Edwards

Thalassomyia africana Edwards, 1926, *Proc. Zool. Soc. Lond.* **51** : 787 ; Edwards, 1935, *Bishop Mus. Bull.* **114** : 88 ; Wirth, 1947, *Proc. Hawn. ent. Soc.* **13** : 135.

Wing length 2 mm.

General colour dark brown. Wirth (1947) distinguishes this species from the others in the genus as follows: styles slender, with blunt tip bearing two setae at extreme apex ; coxite with large thumb-shaped basal lobe which is bare at tip ; female cerci long and extremely slender ; veins M, Cu and 1A bare of setae ; last antennal segment tapered towards the terminal nipple.

Holotype male, TANGANYIKA, Dar-es-Salaam (*R. R. Scott*) in British Museum. There is additional material from the Marquesas Islands.

Genus *TELMATOGETON* Schiner

Telmatogeton Schiner, 1866, *Verh. Zool. Bot. Ges. Wien* **16** : 931 ; Schiner, 1868, *Reise Novara Zool.* **2** : 25 ; Edwards, 1928, Konowia **7** : 234–6 ; Wirth, 1947, *Proc. Hawn. ent. Soc.* **13** : 143–191 ; Wirth, 1949, *Univ. Calif. Publ. Ent.* **8** : 170.
Charadromyia Terry, 1913, *Proc. Hawn. ent. Soc.* **2** : 292.
Trissoclunio Kieffer, 1920, *Ann. S. Afr. Mus.* **17** : 523.

Fifth tarsal segment deeply trilobed ; antennae with seven segments in both sexes ; palpi with two segments ; both sexes fully winged ; pubescence of legs uniform and short ; front femur of male simple.

Two species from S. Africa fall into this genus. The following descriptions and key are based on those given by Wirth (1947).

KEY TO AFRICAN SPECIES OF *Telmatogeton*

Larger species (wing length 5–6 mm.) ; mostly blackish in colour ; wings smoky brown ; scutellum with about 50 setae . . . . . *sancti-pauli* Schiner
Smaller species (wing length 3–3·5 mm.) ; mostly brownish ; wings pearly grey ; scutellum with about 12 setae on lateral edges . . . . . *minor* Kieffer

Telmatogeton sancti-pauli Schiner

Telmatogeton sancti-pauli Schiner, 1868, *Reise Novara Zool.* **2** : 25 ; Edwards, 1928, Konowia **7** : 236 ; Hesse, 1934, *Trans. R. ent. Soc. Lond.* **82** : 27 ; Wirth, 1947, *Proc. Hawn. ent. Soc.* **13** : 182.
Paraclunio fuscipennis Kieffer, 1914, *Ann. S. Afr. Mus.* **10** : 259.
Trissoclunio fuscipennis Kieffer, 1920, *Ann. S. Afr. Mus.* **17** : 523.

Male. Wing length 4–5 mm.

General body colour blackish brown, shoulders paler, halteres yellowish, wings smoky brown.

Antennae 7-segmented, basal segment large and setose, segment 7 three times as long as broad, tapered ; palpi with two segments ; eyes with a ring of long stout hairs curved over to form a basket-like protection. Prothoracic lobes small and practically bare ; mesonotum arched anteriorly, overhanging head, setae small, arising from light coloured spots ; scutellum with about 50 long dark setae, the longest as long as scutellum. Wings with costa, R and base of M more darkly infuscated. Legs long, middle trochanters swollen and with a pad of setae borne on a ventral knob ; posterior tibiae with two spurs (not one as stated by Wirth) ; last tarsal segment trilobed, the median lobe about half length of claws ; empodium large, pectinately plumose ; claws unevenly bifid, lateral tooth pectinate at tip. Hypopygium turned about 15° from horizontal and stout ; styles simple, infolded, flattened and oval ; phallosome complex, with a pair of median slender, sinuous sclerotizations with hooked tips and a pair of adjacent long sabre-like plates each with a shorter curved lateral arm.

Female. Resembles male, except that all tarsal claws are long, pointed and simple; last tarsal segment more deeply trilobed, mid-trochantal knob smaller than in male. Segment 8 of abdomen laterally compressed, tapering in side view and upcurved to a sharp point formed by the pointed cerci, about one and a half times as long as high.

DISTRIBUTION. ST. PAUL I. : 1 ♂, cotype (Novara Reise). CAPE PROVINCE : 1 ♂, 1 ♀, cotypes of *T. fuscipennis*, Cape Town (*Péringuey*) ; 1 ♂, Sea Point, xi.31–i.32 (*A. Mackie*).

Habitat. On rocks covered with growth of algae *Porphyra capensis* and *vulgaris* between tide marks on Atlantic and Indian Ocean sides of Cape and on St. Paul Island, Indian Ocean. The ecology is dealt with by Hesse (1934).

Telmatogeton minor Kieffer

Paraclunio minor Kieffer, 1914, *Ann. S. Afr. Mus.* **10** : 260.
Trissoclunio minor Kieffer, 1920, *Ibid.* **17** : 523.
Telmatogeton minus Edwards, 1928, *Konowia* **7** : 236.
Telmatogeton minor Hesse, 1934, *Trans. R. ent. Soc. Lond.* **82** : 34 ; Wirth, 1947, *Proc. Hawn. ent. Soc.* **13** : 185.

I have no material of this species, but the papers of Hesse and Wirth enable me to distinguish it from *sancti-pauli* as follows :

Wing length 3–3·5 mm.

Size smaller than *sancti-pauli*, more extensively pale in colour ; scutellum with only about 12 hairs ; mid-trochanters without marked protuberance in male ; wings pearly grey, not darkly infuscated ; female abdomen markedly produced, eighth segment over twice as long as high.

Habitat similar to that of *sancti-pauli* but it is less common. Originally described from Cape Town, but also occurs along the south coast on the Indian Ocean.

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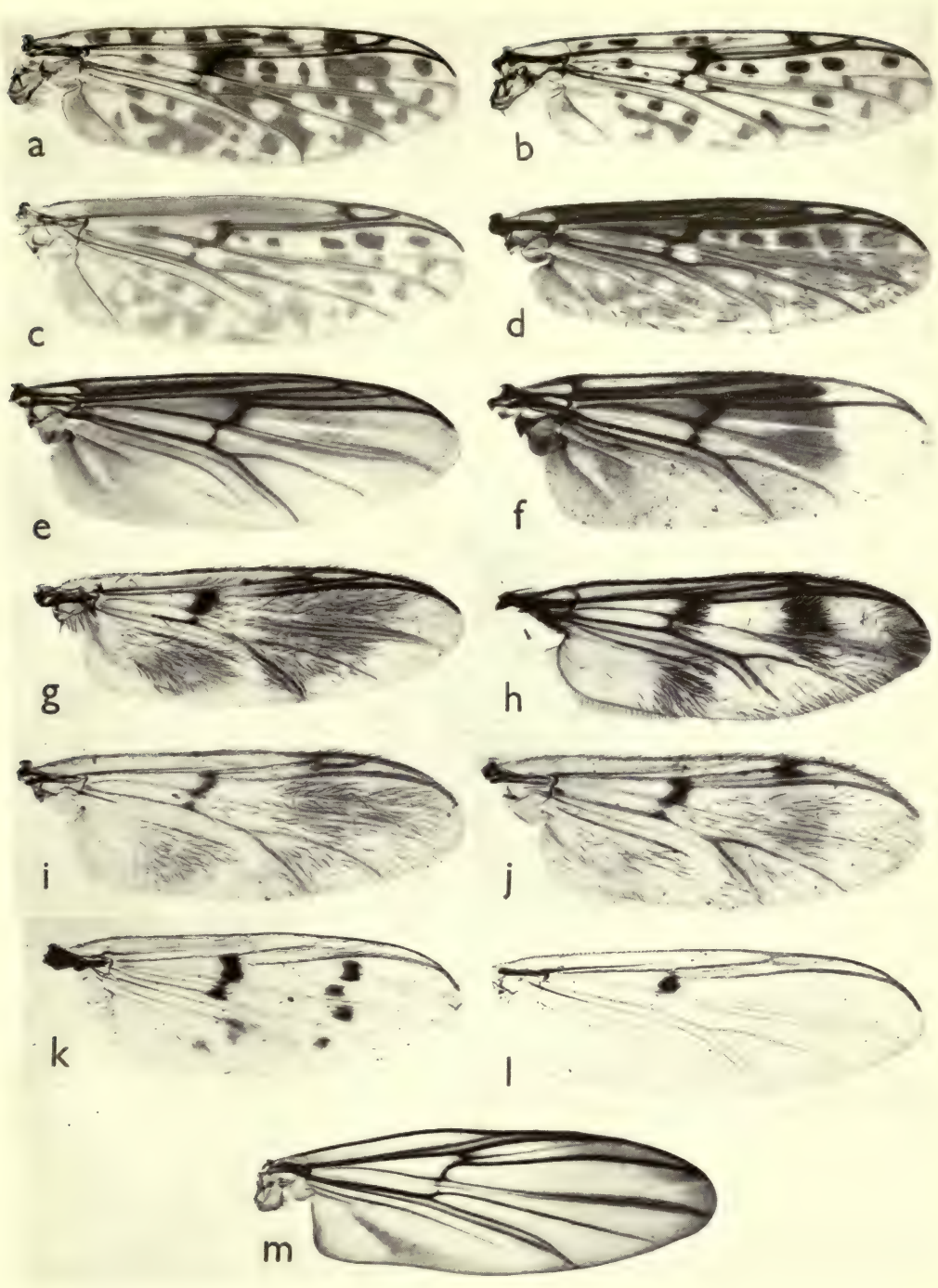
PLATE I

Wings of female Chironomidae. (*a*) *Tanypus lacustris*; (*b*) *T. guttatipennis*; (*c*) *T. brevipalpis*; (*d*) *T. fuscus*; (*e*) *Clinotanypus claripennis*; (*f*) *Cl. rugosus*; (*g*) *Procladius brevipetiolatus*; (*h*) *P. albitalus*; (*i*) *P. noctivagus*; (*j*) *P. polytomus*; (*k*) *P. maculosus*; (*l*) *P. reidi*; (*m*) *Diamesa ruwenzoriensis*.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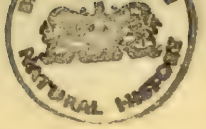
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NEW SPECIES OF EPHEMEROPTERA FROM UGANDA

D. E. KIMMINS

BULLETIN OF
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ENTOMOLOGY Vol. 4 No. 2
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Pp. 69—87 ; 31 *Text-figures.*

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NEW SPECIES OF EPHEMEROPTERA FROM UGANDA

By D. E. KIMMINS

SYNOPSIS

In this paper representatives of the families Heptageniidae (= Ecdyonuridae), Baëtidae, Leptophlebiidae, Tricorythidae, Caenidae and Ephemeridae are dealt with—in all twelve new species.

THIS paper is based mainly upon material sent for identification by Dr. P. S. Corbet, of the East African Fisheries Research Organisation's laboratories at Jinja, and by Mr. R. Hartland-Rowe, of Makerere College, Kampala. Much of Dr. Corbet's material was collected by light trap during experimental work on flight periods of Trichoptera.

The East African Fisheries Research Organisation (subsequently referred to by its initials, E.A.F.R.O.) and Mr. Hartland-Rowe have generously permitted me to retain for the British Museum (Nat. Hist.) much of this material, including types, for which I should like to express my sincere thanks. Where duplicate material permitted, a representative set has been returned to Jinja and to Mr. Hartland-Rowe.

Family HEPTAGENIIDAE.

Afronurus ugandanus sp. n.

(Fig. 1.)

UGANDA: Banks of Nile near Kakindu, 3,400 ft., 24–25.viii.1911, 1 ♂, (*S. A. Neave*). Jinja, 7.ix.1933, 1 ♀ subim., (*G. H. E. Hopkins*), 3.iii.1954, 2 ♀, 1 ♀ subim., (*R. Hartland-Rowe*), xii.1954, numerous ♂ ♀ at light, (*P. S. Corbet*); Ripon Falls, 4.iii.1954, 1 ♂, 1 ♀ (*R. Hartland-Rowe*). Entebbe, 8.iii.1954, 2 ♂, 3 ♀ (*R. Hartland-Rowe*). L. Victoria, Kagera Bay, 15.v.1954, 1 ♀ subim., (*N. E. Hickin*).

NYASALAND: Mt. Mlanje, 17.ii.1911, 1 ♂ (*S. A. Neave*).

Mr. Hartland-Rowe's material was preserved in 2% formaldehyde solution and Dr. Corbet's in 70% alcohol, the remainder pinned. The following description was made from the fluid material and the colours may be somewhat paler than in life.

♂. Head pale yellowish brown, eyes reddish brown. Thorax pale yellowish brown, dorsally with faint brownish markings and lightly marked with purplish brown near the coxae. Legs luteous, anterior femur brownish, other femora slightly brownish towards apices. Terminal segment of all tarsi pale fuscous. Wings hyaline, venation

pale yellowish brown. Abdomen yellowish, above pale brownish or reddish, segments II to VII with two short, curved, yellowish streaks, one on each side of the median dorsal line at the base, and the sides of each segment more or less yellowish. Cerci pale yellowish. Forceps and base luteous, the latter with its apical margin quadrately excised between the bases of the forceps, margin of excision sinuous, inner angles of the bases produced in rounded lobes. Forceps four-segmented, basal segment short, tapering, second long, cylindrical, third and fourth short, apex of fourth somewhat concave. Penis-lobes each bilobed, the inner lobes longer than the outer, curved

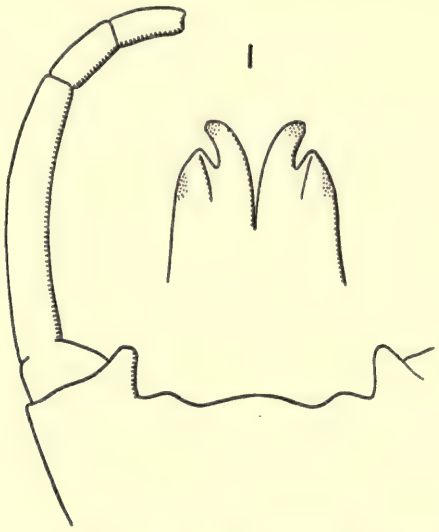


FIG. 1.—*Afronurus ugandanus* sp. n. ♂. Forceps-base, forceps and penis-lobes, the latter more enlarged.

upward and outward, outer broader and more triangular, separated from the inner by a narrow excision. Apex of inner lobe and lateral margin of outer each with a small, finely punctate area.

♀. Markings similar to male but paler. Subgenital plate with sides parallel for a short distance, then tapering to a truncate or slightly excised apex, the whole plate curving downward.

♀ subimago. Head yellowish brown, eyes blackish, a dark, purplish brown line along posterior margin of head between them. Thorax cream-coloured, with pale brown markings above, sides lightly marked with purplish red. Legs luteous, streaked with pale fuscous. Wings smoky fuscous, paler near anal angle, with cream venation, costal and subcostal areas of fore wing and bases of both wings cream. Abdomen dull yellowish with obscure reddish markings dorsally.

Length of fore wing ♂, 8–9 mm., ♀, 11–12 mm.

♂ type (Entebbe, 8.iii) in 2% formaldehyde solution, with apex of abdomen mounted as a microscope preparation; paratypes in Brit. Mus. (N.H.), E.A.F.R.O.

and Hartland-Rowe collections. This species differs from *A. peringueyi* (Esben-Petersen), as figured by Barnard, in the form of the penis-lobes, the outer lobes being relatively broader and having the finely punctate area on the outer (not inner) margin. The inner angle of the forceps-base is more strongly lobed.

Family Baëtidae

In this family I have adopted an interpretation of the segments of the forceps differing from that in current use. It appears to me that the so-called basal segment of the forceps in this family is more probably part of the forceps-base, almost completely divided into two parts, since it is filled with muscular tissue, a state which, according to Needham, does not occur in the true segments of the forceps. My interpretation of the forceps therefore credits them with one segment less than is normally recorded.

Centroptilum sudanense Ulmer

(Fig. 2.)

Uganda: Jinja, 6.iii.1954, 2 ♂ (*R. Hartland-Rowe*).

The two specimens before me have been preserved in 2% formaldehyde solution. They are not in good condition and are considerably bleached. The male genitalia are unusual in form for *Centroptilum* and as they show considerable similarity to those figured by Ulmer for *sudanense*, these specimens have been referred to that species. Ulmer shows the forceps as obscurely divided into three segments. The present examples show no sign of such segmentation and it is possible that the divisions shown by Ulmer were the result of dessication. I am figuring a ventral view, for comparison with *C. notabile* sp. n.

Centroptilum notabile sp. n.

(Figs. 3–5.)

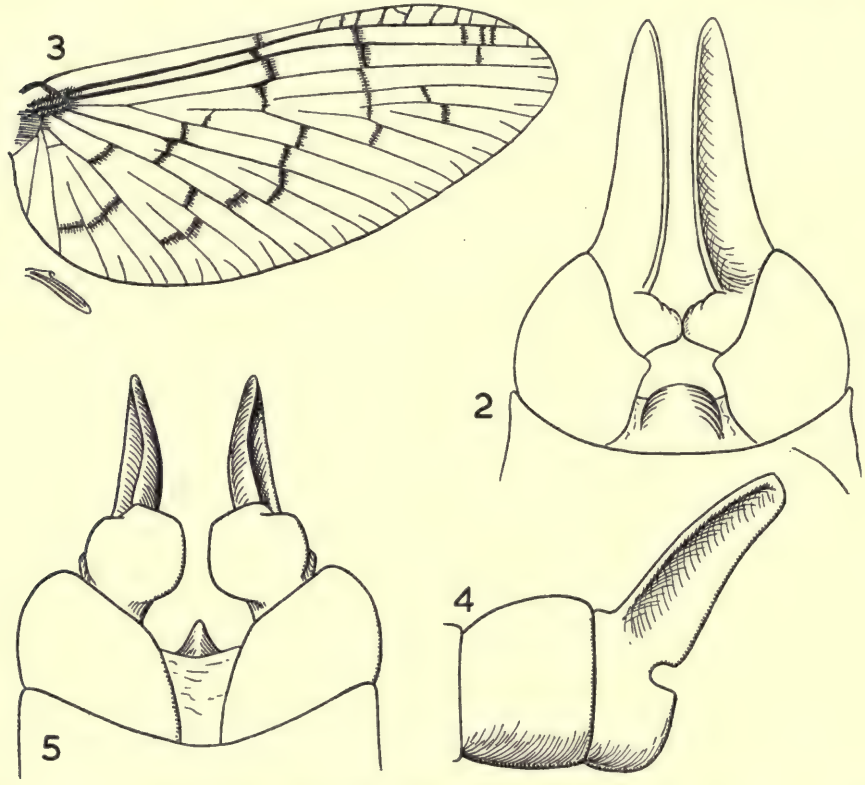
Uganda: Jinja, 7.v.1954, 1 ♀ (*N. E. Hickin*); at light, ix–xii.1954, 2 ♂, numerous ♀, (*P. S. Corbet*).

♂ (in 70% alcohol). Head ivory-white, ocelli ringed with piceous. Turbinate eyes orange, lower eyes black. Antenna whitish. Prothorax whitish. Mesonotum pale fuscous, sutures darker, scutellum and post-scutellum ivory-white. Metanotum pale to medium fuscous. Sides of thorax whitish, episterna medium fuscous, mesepisternum with a round, blackish spot. Legs greyish or very pale fuscous, faintly marked with reddish at knees. Fore wing hyaline, longitudinal veins whitish, cross-veins fuscous and margined with the same colour. Base of wing tinged with fuscous and orange. About six costal cross-veins beyond the bulla. Hind wing typical of genus.

Abdomen translucent whitish, apices of tergites very faintly margined with pale reddish, tergites III and V each with a curved, purplish black line near apex, the ends curving forward like horns. Cerci lacking in type. Genitalia similar in pattern to *C. sudanense*. Forceps-base large, divided medianly to form two stout lobes with obliquely truncate apices. Between them can be seen a small, pointed plate. Forceps

stout, apparently single-segmented ; in side-view directed obliquely upwards, base stout, globular, the lower margin with a small rounded excision. Terminal part of forceps spatulate, its outer surface concave.

♀. Pronotum with scattered purplish black markings. Meso- and metathorax paler than in ♂, mesepisternal spot conspicuous. Abdomen with the curved marking on tergite III with its centre produced forward to within one third from the base ;



FIGS. 2–5.—(2) *Centroptilum sudanense* Ulmer, ♂ genitalia, lateral. (3–5) *C. notabile* sp. n. ♂. (3) Wings. (4) Forceps-base, forceps, left lateral. (5) The same, ventral.

a similarly shaped spot occurs on tergite VI and suggestions of such markings on tergites VII–VIII.

Length of fore wing ♂ ♀, 5 mm.

♂ type, ♀ allotype mounted as whole preparations in euparal ; paratypes in Brit. Mus. (N.H.) and E.A.F.R.O. collection. This species is related to both *Centroptilum nitidum* Ulmer and *C. sudanense* Ulmer. The former, described from females from Belgian Congo, has the cross-veins of the fore wing shaded with brown, but the dorsal surface of the abdomen is much more extensively marked with reddish. *C. sudanense* has the fore wing cross-veins pale, and abdominal tergites more extensively marked.

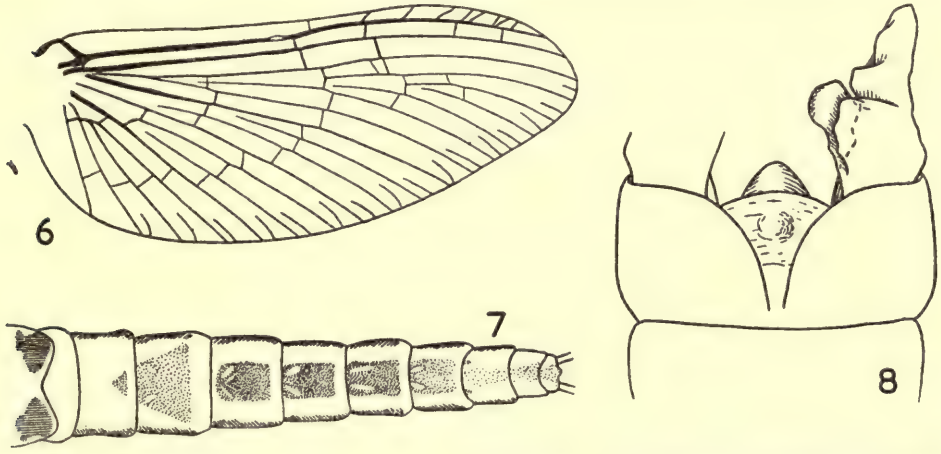
In side view, the forceps of *C. notabile* are less tapered, the ventral excision larger and the basal part more globular. The sclerotized plate between the bases of the forceps is more pointed.

Centroptilum corbeti sp. n.

(Figs. 6–8.)

UGANDA : Jinja, xii.1954, at light, 6 ♂, 8 ♀, (*P. S. Corbet*).

♂ (in 70% alcohol). Head creamy white, turbinate eyes large, not very tall, chocolate-brown, lower eyes grey. Thorax creamy white, lightly marked dorsally with a fuscous stripe on each side of the median suture, a patch of fuscous near the wing-base and with a reddish spot on each side in front of the wing-base. Metanotum more heavily shaded with fuscous. Legs with the femora whitish, the anterior heavily



FIGS. 6–8.—*Centroptilum corbeti* sp. n. ♂. (6) Wings. (7) Pattern of abdomen, dorsal. (8) Forceps-base and forceps, ventral.

shaded with reddish and with traces of reddish on the median and posterior femora. Tibiae and tarsi fuscous. Fore wing hyaline, with strong fuscous venation. No cross-veins before the bulla, 9–11 in the pterostigma. The subcosta and radius at base are suffused with reddish. Hind wing microscopic, narrow, about 0·25 mm. in length.

Abdomen whitish, lateral margins of segments II–VIII narrowly bordered with fuscous. There is a median, reddish, dorsal stripe on segments II–X, interrupted at the joints of the abdomen and including a pair of small whitish spots near the bases of segments III–VII. Abdomen whitish beneath, cerci fuscous. Forceps-base and forceps whitish. Forceps-base from beneath divided almost to its base to form two broad lobes, apical margins somewhat oblique. Forceps apparently one-segmented, twice as long as lobe of forceps-base, three-branched, the basal (lowest) branch short

and blunt, the second arising just above the first on the inner margin, curving upward, the third or terminal branch digitate, with a rounded projection on the inner margin near its base. The inner surface of the forceps is rather rugose. Between the bases of the forceps, and at a higher level, can be seen a parabolic lobe.

♀ (in 70% alcohol). Resembling the male but the thorax has rather more extensive fuscous markings dorsally, legs and venation a little paler.

Length of fore wing ♂, 10 mm., ♀, 11·5 mm.

♂ type, ♀ allotype (in 2% formaldehyde solution) ; paratypes in Brit. Mus. (N.H.) and in E.A.F.R.O. collection. This striking insect, with its fuscous tibiae, tarsi and cerci contrasting strongly with the cream ground-colour of the body, should be easily recognizable. In the field it is possible that the ground colour may be some fugitive colour, such as green, which is removed by preservation in alcohol. In the venation of the fore wing it approaches *C. pulchrum* Crass (*nec* Eaton), in which species the hind wing is said to be completely suppressed in both sexes. In the present species the hind wing, although present, is microscopic (0·25 mm.) and apparently without costal process. The robust, apparently single-segmented forceps separate it from any other African *Centroptilum* species known to me except *C. sudanense* Ulmer and *C. notabile* sp. n., and in these species the hind wing is typical of the genus. In the fore wing of *C. corbeti* the intercalary veins extend even further basally than in *C. pulchrum* Crass.

Cloëon dentatum sp. n.

(Fig. 9.)

Uganda : Jinja, at light, ix–x.1954 3 ♂, 1 ♂ subimago, (*P. S. Corbet*).

♂ (in alcohol). Head fuscous, turbinate eyes chocolate-brown, lower eyes grey-black. Pronotum reddish, meso- and metanota shining dark fuscous, tinged in places with reddish. Legs very pale ochraceous, median and posterior femora each with a faint reddish ring before the apex. Wings hyaline-iridescent, venation light fuscous, about five oblique cross-veins in pterostigma. Abdomen with segments I–VII translucent whitish ; tergite I reddish at base and apex, tergites II–VII each with a pale fuscous or reddish, transverse, pre-apical line, a greyish, median, basal spot and traces of two fine, parallel, median, reddish lines, tergite IV also with a small reddish spot towards each lateral margin. Tergites VIII–IX bright reddish fuscous, X fuscous. Sternites whitish, I–VI each with a small greyish spot at the centre of the apical margin, sternite IX and forceps pale fuscous. Cerci broken in type series.

Forceps-base with its lateral angles stout, cylindrical, apices rather oblique and with their inner apical angles produced in a strong, rounded projection or tooth, the apical margin between them rounded. Basal segment of forceps indistinctly separated from second, short and narrow. Second segment long, its inner basal angle dilated to form a strong tooth, beyond which the segment is abruptly narrowed and then slightly dilated to its apex. Terminal segment short, dilating to an obliquely truncated apex. Above the forceps-base can be seen an arched, sclerotized plate.

♂ Subimago (in alcohol). Head creamy white, turbinate eyes dark greyish lavender, ocelli ringed with black. Pronotum light ochraceous, tinged with reddish. Mesonotum light fuscous, sutures whitish and dark fuscous. Legs light ochraceous, median and posterior femora tinged with reddish as in imago. Cerci white.

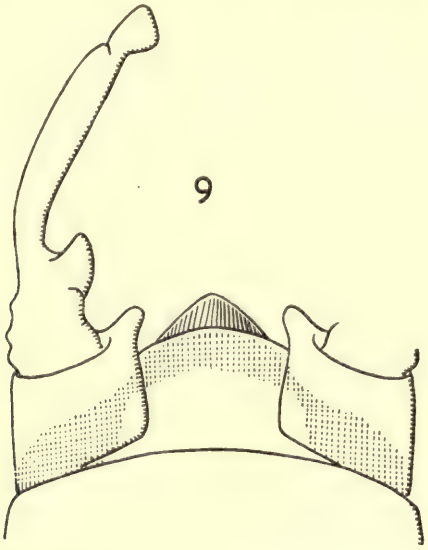


FIG. 9.—*Cloëon dentatum* sp. n. ♂. Forceps-base and forceps, ventral.

Length of fore wing 4 mm.

♂ type mounted whole in euparal as a microscope preparation. The unusual form of the forceps should render the recognition of this species easy in the male sex. I do not know of any African species of *Cloëon* with which to compare it.

Family LEPTOPHLEBIIDAE

Adenophlebiodes decoratus sp. n.

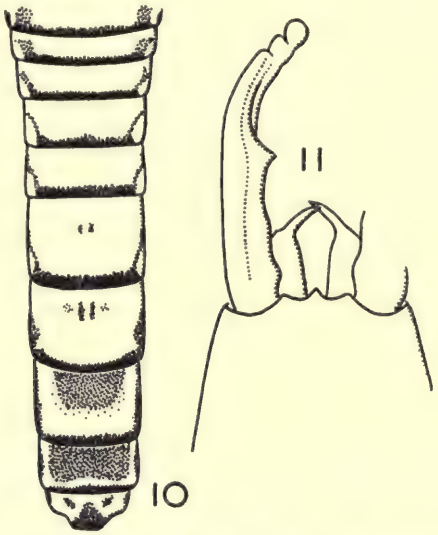
(Figs. 10, 11.)

UGANDA: Jinja, 6.iii.1954, 1 ♂, (*R. Hartland-Rowe*); xii.1954, numerous ♂ ♀ at light, (*P. S. Corbet*). Jinja, Ripon Falls, 6.iii, 21.ix.1954, (*P. S. Corbet*). Kaazi, 16.ii, 12.viii.1954, 2 ♀, 1 ♀ subimagines, (*R. Hartland-Rowe*).

♂ (in 2% formaldehyde solution). Head fuscous, eyes chocolate-brown. Pronotum fuscous, with a purplish tinge. Meso- and metanota very pale fuscous, tinged with purplish. Legs whitish, femora banded with purplish brown at about midway and apex, fore tibia faintly purplish towards apex. Wings hyaline, venation very pale fuscous, the base of the subcosta and the humeral cross-vein in the fore wing purplish. The basal half of the fore wing is very faintly suffused with pale fuscous.

Abdomen translucent whitish, dorsal segments I–VII with apical margins marked with purplish black, which extends as a paler, oblique streak to the spiracles. VIII–IX with more extensive purplish black colouration, deepest at apical margins, the white ground colour only appearing as a longitudinal streak near each lateral margin and a subapical median spot. X whitish, with the apex, a median streak and two basal spots purplish. Ventral surface of abdomen whitish. Cerci white, banded with purplish black. Genitalia white.

♂ subimago (in 2% formaldehyde solution). Markings similar to ♂ imago, those of the legs more defined. Abdominal markings rather less extensive. Cerci conspicuously annulated with purplish black. Wings translucent whitish, without indications of a brownish basal tinge.



FIGS. 10, 11.—*Adenophlebiodes decoratus* sp. n. ♂. (10) Pattern of abdomen, dorsal. (11) Forceps-base, forceps and penis-lobes, ventral.

♀ subimago (in 2% formaldehyde solution). Head whitish, marked with purplish. Pronotum purplish, with whitish markings. Meso- and metanota pale fuscous, with obscure purplish markings. Legs marked as in male. Abdomen with purplish red markings, more extensive but less intense than in male.

Length of fore wing, ♂ ♀, 9 mm.

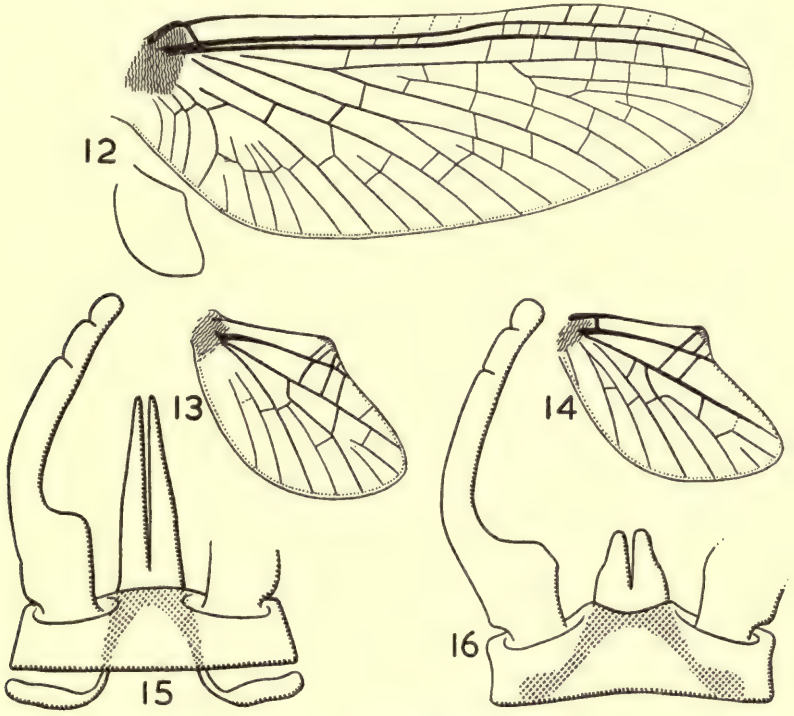
♂ type (Jinja, 6.iii) in 2% formaldehyde; paratypes in Brit. Mus. (N.H.), E.A.F.R.O., and Hartland-Rowe collections. In venation and form of male genitalia, this species agrees well with the characters of *Adenophlebiodes*. It differs from *A. ornata* Ulmer and *A. bicolor* (Crass) in the almost colourless basal half of the fore wing and the colourless hind wing. From *A. delamarei* (Verrier), it differs in the absence of any definite pattern in the basal part of the fore wing, and in the presence of purplish markings on the femora, which are neither figured nor mentioned in Verrier's description.

Euthraulus bugandensis sp. n.

(Figs. 12, 13, 15.)

UGANDA: Entebbe, 8.iii.1954, 3 ♂, 4 ♀ imagines, 1 ♀ subimago (*R. Hartland-Rowe*).

♂ (in 2% formaldehyde solution). Head brownish, turbinate eyes dull orange, lower eyes grey. Pronotum brownish, meso- and metanota dark brown. Femora pale fuscous, darker at apices, tibiae and tarsi ochraceous, the former fuscous at



FIGS. 12–16.—*Euthraulus* spp. n. ♂. (12) *E. bugandensis*, wings. (13) Hind wing, more enlarged. (14) *E. curtus*, hind wing. (15, 16) Forceps-base, forceps and penis-lobes, ventral. (15) *E. bugandensis*. (16) *E. curtus*.

base. Wings hyaline, C, Sc, and R in fore wing yellowish brown, remaining veins pale or colourless. Abdomen above mainly fuscous, segments I–IX with a narrow, apical, pale band, II–VIII with a fine, median, longitudinal, pale line; on each side of it, at the base, is a faint, pale, triangular spot, and there is also an ovate, pale spot near each dark fuscous lateral margin. Sternites I–VIII very pale fuscous, IX dark fuscous with a cream, semi-elliptical patch apically, not quite reaching the base of the sternite. Forceps-base pale fuscous, its apical and basal margins darker. Forceps pale cream, the extreme base narrowly fuscous. The basal segment is more abruptly

constricted than in *E. elegans* Barnard, the margins at the base parallel-sided, the part beyond the constriction more slender and the second segment is nearly twice as long as the terminal segment. Penis-lobes long, divided almost to the base, more slender than in *E. elegans*. Cerci cream.

♀ (in 2% formaldehyde solution). Head ochraceous, between the ocelli (which are ringed with piceous) fuscous. Eyes black. Pronotum pale fuscous, with traces of two longitudinal bands and the lateral margins darker. Meso- and metanota brownish. Legs as in ♂. Wings with venation paler. Abdomen above brownish, with obscure paler markings, ventrally pale fuscous with a pair of small, fuscous spots on each sternite. Seventh segment rather darker, ninth forming a parabolic plate with a small, obtuse-angled excision at its apex. Cerci pale ochraceous.

♀ subimago similar in markings to imago.

Length of fore wing ♂ 7 mm., ♀ 8 mm.

♂ type, ♀ allotype in 2 % formaldehyde solution ; paratypes in Brit. Mus. (N.H.) and Hartland-Rowe collection. The differences between this species and *E. elegans* Barnard have been detailed in the foregoing description of the male. In addition it is noticeably more robust.

Euthraulus curtus sp. n.

(Figs. 14, 16.)

UGANDA : Kazi, 8.iii.1954, 2 ♂, 2 ♀ imagines, (*R. Hartland-Rowe*). Jinja, 3–6.iii. 1954, 1 ♂, 2 ♀ imagines, 5 ♂, 4 ♀ subimagines, (*R. Hartland-Rowe*). Jinja, at light, ix–x.1954, numerous subimagines, (*P. S. Corbet*).

♂ (in 2% formaldehyde solution). Head light fuscous, darker around the ocelli. Turbinate eyes pale orange (possibly somewhat bleached), lower eyes dark grey. Thorax shining dark brown, lateral margins of meso- and metathorax creamy white. Legs pale luteous, femora marked with fuscous at base and apex, and with an indistinct, subapical ring. Tibiae fuscous at extreme base. Wings hyaline, in fore wing with C, Sc and R pale fuscous, remaining veins pale. Venation much as in *E. bugandensis*. Abdomen above dirty whitish, with a fine stippling of purplish grey, which becomes denser towards the apex of each segment. There is a pale, mid-dorsal line and the lateral margins are darker brown. The pale dorsal line fades out on segments IX and X. Sternites I–VIII white, apical angles purple-grey, IX white with dark brown lateral bands, somewhat wider at base. Cerci whitish. Forceps-base whitish, finely bordered with fuscous, its apical margin excised. Forceps whitish, basal segment stout at base in ventral view, the lateral margins somewhat divergent until the constriction, thence parallel-sided. Second segment about twice as long as terminal segment. Penis-lobes short and stout, only about half as long as basal segment of forceps, divided almost to base.

♀ (in 2% formaldehyde solution). Head medium fuscous, ocelli ringed with dark brown, eyes piceous. Pronotum fuscous, with a dark ochraceous, median stripe. Meso- and metanota dark brown, paler at sides. Legs ochraceous, with fuscous markings as in male or at times stronger. Wings hyaline, C, Sc and R yellowish brown, remainder almost colourless. Abdomen yellowish brown above, with traces

of a pale mid-dorsal line similar to that of male. Ventrally yellowish (? due to enclosed eggs), sternite IX produced in a variable triangular plate with a truncate or excised apex.

♂♀ subimagines similar in markings to imagines, the abdominal tergites sometimes with a pair of pale basal triangles, one each side of dorsal line.

Length of fore wing, ♂ 6·5 mm., ♀ 7 mm.

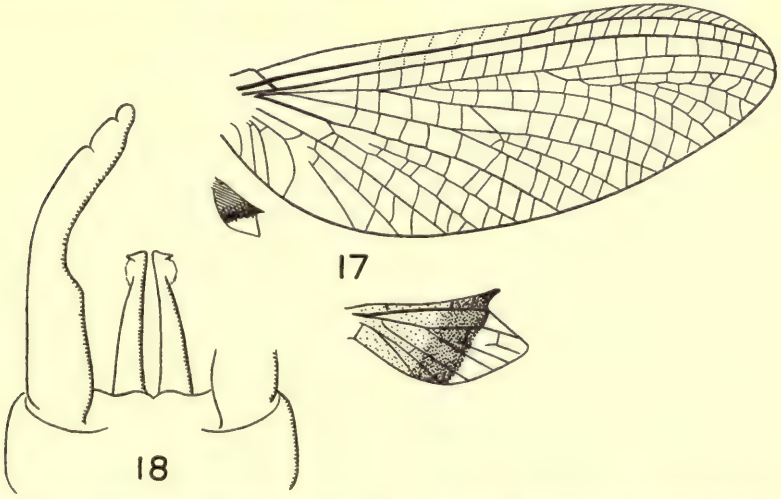
♂ type (mounted in euparal as microscope preparations), ♀ allotype (in 2% formaldehyde solution), both from Kazi, 8.iii.1954; paratypes in Brit. Mus. (N.H.), E.A.F.R.O. and Hartland-Rowe collections. This species differs from both *E. elegans* and *E. bugandensis* in the much shorter and blunter penis-lobes in the male, which are barely half as long as the basal segment of the forceps. It resembles *E. bugandensis* in the slender forceps, but the basal part is less parallel-sided and the apical margin of the forceps-base is excised at its centre.

Hagenulus fasciatus sp. n.

(Figs. 17–18.)

UGANDA: Kaazi, 12.viii.1954, 1 ♂, (*R. Hartland-Rowe*). Jinja, at light, ix–x.1954, 2 ♂, (*P. S. Corbet*).

♂ (in 2% formaldehyde solution). Turbinate eyes light chocolate-brown, lower eyes purplish brown. Thorax shining brown above (in the type somewhat obscured



FIGS. 17, 18.—*Hagenulus fasciatus* sp. n. ♂. (17) Wings, with hind wing more enlarged. (18) Forceps-base, forceps and penis-lobes, ventral.

by an adventitious white deposit), dull ochraceous and brownish at the sides. Anterior femur ginger-brown, tibia with basal two-thirds fuscous, apex and tarsus white. Median and posterior legs with femora ochraceous, with a broad median ring of light ginger-brown, apices fuscous; tibiae fuscous on basal third, remainder and

tarsi whitish. Fore wing hyaline, slightly fuscous basally, venation pale fuscous (fig. 17). Hind wing hyaline, with a narrow, transverse, fuscous band at the level of the costal projection ; basad of this transverse band the membrane is very pale fuscous and the apex, beyond the band, colourless. Costal projection acute, prominent.

Abdomen above shining brown, tergite I with an ochraceous patch on each side, tergite IX with an inverted, L-shaped, ochraceous patch laterally. Sternites pale fuscous, I, VIII and IX mainly ochraceous. Cerci fuscous basally, shading to whitish with narrow, fuscous annulations. Forceps pale fuscous, whitish apically. Forceps-base with a sinuous apical margin, its centre with a small median excision. Basal segment of forceps (fig. 18) long, moderately broad, the inner margin becoming closer to the outer about midway, where the forceps is curved inwards. Second and third segments small, third about half as large as second. Penis-lobes long, slender, sub-parallel and tapering. The outer margin is dilated immediately before the apex, which carries a small, out-turned beak.

Length of fore wing 7·5 mm.

♂ type (Kaazi) in 2% formaldehyde solution (one pair of wings dry and genitalia mounted in euparal on microscope slides) ; one paratype in Brit. Mus. (N.H.), one paratype in E.A.F.R.O. collection, Jinja. This species differs from *H. scotti* Ulmer in its larger size, denser venation and in the striking, pigmented pattern of the hind wing. It also resembles in venation *Habrophlebiodes semicastanea* Gillies, but in this Indian species the hind wing is unpigmented.

Family Tricorythidae

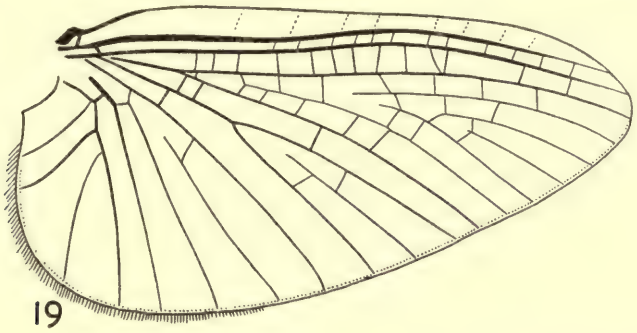
Tricorythus tinctus sp. n.

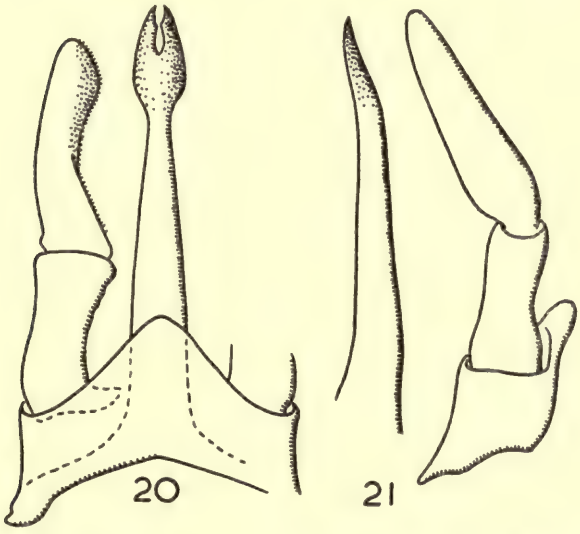
(Figs. 19–21.)

Uganda : Owen Falls Dam, at light, collected dead, 24.iv.1954, 30 ♂, 15 ♀, (*P. S. Corbet*). Jinja, Ripon Falls, 25.viii.1954, 1 ♂, 2 ♀ (*R. Hartland-Rowe*). Jinja, at light, xii.1954, 3 ♂, 5 ♀, (*P. S. Corbet*).

♂. Head and eyes pitchy black, with a pair of small white spots on the vertex between the ocelli. Antenna with basal segment whitish, inner surface shaded with piceous, remainder of antenna translucent whitish. Pronotum piceous, with scattered whitish markings, the centre and lateral markings suffused with reddish purple. Meso- and metathorax pale ochraceous, mesonotum very finely stippled with piceous, sutures piceous, the triangular posterior part slightly tinged with purplish. Meta-notum with a transverse, piceous band. Femora blackish, banded midway and at apices with white. Tibiae blackish, with white apices, tarsi greyish, white at apices. Wings hyaline, costal and subcostal areas grey, veins yellowish and narrowly margined with yellowish, giving the wings a yellowish tinge. Abdominal segments I–VIII transparent, tergites shaded with blackish apically, I–VI tinged with reddish purple except at the base, IX–X blackish. Cerci transparent whitish. Forceps-base whitish, its apical margin produced in a triangle. Forceps colourless, semi-transparent and long, terminal segment about one and one half times as long as, and about as broad

as the basal, not or scarcely tapering, slightly incurved from beneath. Basal segment a little constricted about midway. Penis long and slender, colourless and semi-transparent except at its apex, which is ochraceous. From the side it tapers gradually to an acute apex, from beneath the apex is narrowly spoon-shaped, with a median excision.





FIGS. 19–21.—*Tricorythus tinctus* sp. n. ♂. (19) Wings. (20) Forceps-base, forceps and penis-lobes, ventral. (21) The same, left lateral.

♀. Considerably more robust than male. Head almost entirely black above. Pronotum blackish, suffused with reddish purple as in male. Meso- and metanota light fuscous, sutures paler or bordered with dark fuscous. Legs marked as in male. Wings greyish hyaline, fringed, venation grey. Abdomen ochraceous in gravid females, greyish hyaline after oviposition, tergites shaded with greyish (darkest at apical margin) and tinged with reddish purple. Tergite X entirely grey. Sternites

each with a pair of widely-separated, divergent, grey lines, VII mainly fuscous, IX produced in an elliptical subgenital plate. Cerci short, white, fringed.

Length of fore wing, ♂ 6 mm., ♀ 9·5 mm.

♂ type, ♀ allotype in 2% formaldehyde solution (Owen Falls Dam); paratypes in Brit. Mus. (N.H.), E.A.F.R.O. and Hartland-Rowe collections. This species is closely related to *T. longus* Ulmer from the Congo and Sudan. Its coloration is much darker, the males distinctive with their yellowish tinged wings contrasting with the grey anterior edge. The male genitalia are also similar, but differ in the less tapered terminal segment of the forceps, the stouter basal segment and the more suddenly dilated apex of the penis in ventral view and in the more finely tapered, acute apex of the penis in side view.

Family Caenidae

Caenodes jinjana sp. n.

(Figs. 22, 23.)

Uganda: Jinja, ix–x.1954, 14 ♂, 56 ♀, (*P. S. Corbet*).

♂ (in 70% alcohol). Head pale cream, shaded with greyish, eyes black, ocelli ringed with black basally. Antennae whitish, terminal filament greyish. Pronotum pale, with indefinite greyish markings. Mesonotum pale ochraceous, sutures pale fuscous. Metanotum pale ochraceous. Anterior legs grey, with darker markings, other legs white. Wings hyaline, anterior margin shaded with grey, costa, subcosta and radius grey, other veins pale. Abdomen translucent whitish, tergites VIII–X lightly shaded with grey, VIII–IX also with a fine blackish lateral line on each side. Cerci transparent, whitish. Forceps white or very pale grey, penis white. Forceps-base roundly produced at its apex between the forceps, which are moderately slender, slightly wider at base and apex, the latter terminating in an acute, inwardly-directed spine. Penis-lobes broad at base, somewhat narrower and parallel-sided from a little before midway to apex, which is widely and deeply excised.

♀. Colouration and markings similar to male.

Length of fore wing ♂ 1·9 mm., ♀ 2·2 mm.

♂ type mounted in euparal as a microscope preparation, ♀ allotype in 2% formaldehyde solution; paratypes in Brit. Mus. (N.H.) and E.A.F.R.O. collection. This species differs from *Caenodes ulmeri* Kimmins in its generally paler colouring, the more slender forceps, rounded forceps-base and less constricted, more deeply excised penis-lobes.

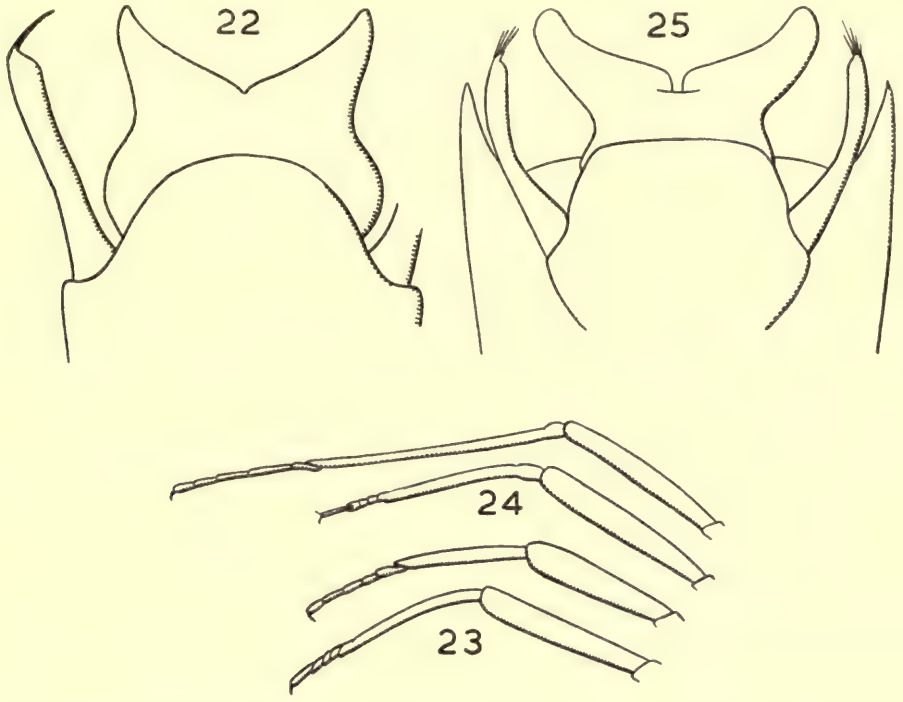
Caenis brevipes sp. n.

(Figs. 24, 25.)

Uganda: Jinja, at light, xii.1954, 6 ♂, 1 ♀, (*P. S. Corbet*).

♂ (in 70% alcohol). Head fuscous above, with whitish sutures and fine dots, back of head whitish. Ocelli white, eyes purplish black. Antenna white, joints and terminal style lightly fuscous. Pronotum dark grey with whitish markings. Meso- and metathorax creamy white, faintly shaded with pale grey. Legs whitish, anterior

femur streaked with fuscous, strongly so along upper margin. Fore leg rather shorter than is normal in *Caenis* but longer than in *Caenodes*, fore tibia about as long as hind tibia and tarsus combined (fig. 24). Wing hyaline, anterior margin (costal, subcostal and radial areas) purplish grey. Abdomen whitish, all tergites shaded with grey, leaving only a narrow band at base and apex and a narrow, median stripe whitish. Lateral margins of tergites II–VI also whitish, III–VI with a more definite



FIGS. 22–25.—*Caenodes* and *Caenis*. (22) *Caenodes jinjana* sp. n., ♂ forceps-base, forceps and penis-lobes, ventral. (23) *C. jinjana*, ♂ fore and hind legs. (24) *Caenis brevipes* sp. n. ♂ fore and hind legs. (25) *C. brevipes*, forceps-base, forceps and penis-lobes, ventral.

black speck towards basal angles. Ventrally whitish, lateral margins of sternites II–IX marked with blackish, VIII–IX with faint blackish markings basally. Forceps pale fuscous, cerci white. Forceps-base produced trapezoidally, apical margin obscure. Forceps a little incurved, slightly constricted midway, apex contracted, acute and fringed with short bristles. Penis-lobes wide-spreading, apical margin shallowly excised, with a small median notch.

♀. Larger than male, more strongly marked, thorax pale yellowish fuscous.

Length of fore wing ♂, 2·3 mm., ♀, 2·9 mm.

♂ type, ♀ allotype mounted whole as microscope preparations in euparal; paratypes in E.A.F.R.O. collection, Jinja and Brit. Mus. (N.H.). This species appears to

be related to a new species of *Caenis* from Nyasaland, (in press), but the penis-lobes are even more widely divergent, the forceps constricted midway and the fore leg of the ♂ relatively shorter. This reduction in the fore leg at first raised doubts as to whether *Caenodes* was truly distinct from *Caenis*. The fore leg of the present species is certainly intermediate between typical *Caenis* and *Caenodes*, but I consider it to be a somewhat abnormal *Caenis*. I am still in favour of retaining *Caenodes* as a separate genus, distinguished by having the ♂ fore leg scarcely longer then the hind leg. In *Caenis* the ♂ fore tibia should be at least as long as the hind tibia and tarsus combined. Should further species be discovered showing still more intergrading, it will, of course, be necessary to revise these views. In the figures given here of the legs of the two genera, the magnification of *Caenodes* has been so adjusted that the length of the hind femur in both genera is the same, thus facilitating comparison of the relative lengths.

Family Ephemeridae

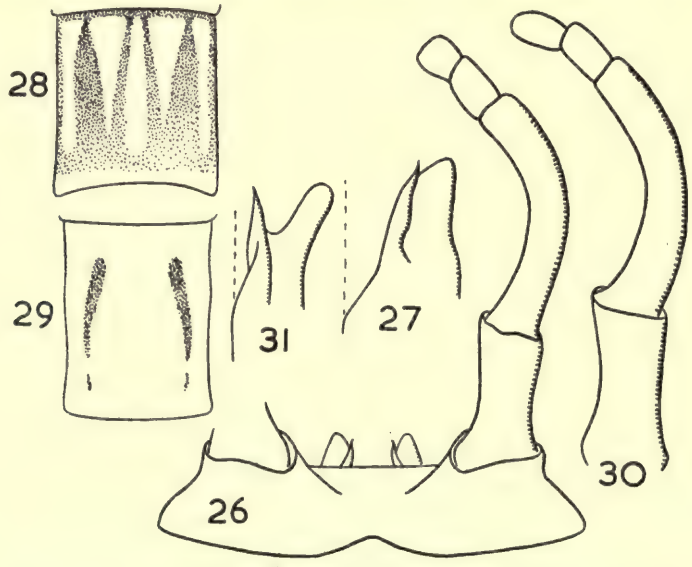
Ephemera aequatorialis sp. n.

(Figs. 26–31.)

Uganda: Kaazi, 13.viii.1954, 2 ♂ imagines, 1 ♀ subimago, (*R. Hartland-Rowe*). Jinja, xii.1954, 6 ♂, 2 ♀, (*P. S. Corbet*); L. Victoria, Kagera Bay 12.v.1954, numerous subimagines (*N. E. Hickin*).

Sierra Leone: Njala, 7.ii.1933, 1 ♂, (*E. Hargreaves*).

♂ (in 70% alcohol). Head ivory-white in front, pale fuscous above, bases of lateral



Figs. 26–31.—*Ephemera* spp. ♂. (26) *E. aequatorialis* sp. n., forceps-base, forceps and penis-lobes, ventral. (27) Right penis-lobe, more enlarged. (28) Pattern of seventh tergite. (29) Pattern of seventh sternite. (30) *E. natalensis* Barnard, right forceps, ventral. (31) Right penis-lobe, ventral.

ocelli dark fuscous. Antenna with basal segments ivory-white, terminal style fuscous. Eyes purplish black. Prothorax pale fuscous above, lateral margins whitish, meso- and metanota pale shining fuscous, sutures cream and white, lateral margins whitish. Anterior femur white, tinged with fuscous apically, tibia and tarsus fuscous. Median and hind legs very pale fulvous. Wings hyaline, membrane slightly smoky brown, venation fuscous and margined with the same tint. In the fore wing the subcostal area is clouded with fuscous and in the hind wing the posterior margin is shaded with fuscous.

Abdomen ivory-white, tergites II–IX marked as follows : a narrow, transverse, basal band, not reaching the lateral borders, from which arises a pair of narrow longitudinal stripes separated by a median pale line, and from the outer ends of the basal band another longitudinal stripe, at first narrow but dilating and linking up with the median stripe before the apex of the segment. These markings are reddish black and the lateral margins are pale fuscous. Tergites I and X pale fuscous, the latter with a darker median stripe. Sternites III–IX each with a pair of well-separated blackish streaks. Forceps and base pale fuscous, cerci fuscous. Forceps-base wide, moderately produced on each side. Basal segment of forceps cylindrical, about half as long as the curved second segment. Third and fourth segments short. Penis-lobes stout, with ovate apices, and with appressed spiniform titillators.

♀. Dorsal abdominal markings more extensive than in male, but lateral markings almost obsolete. Wings hyaline, costa, subcosta, radius, costal and subcostal cross-veins fuscous, subcostal area fuscous, venation otherwise whitish. Cerci pale fuscous.

Length of fore wing, ♂ 12 mm., ♀ 13 mm.

♂ type, ♀ allotype (Jinja, xii.1954), preserved in 2% formaldehyde solution ; paratypes in Brit. Mus. (N.H.), E.A.F.R.O. collection and in Hartland-Rowe collection. This species may be separated from *E. natalensis* Barnard by the two pairs of reddish black markings on the tergites, the single pair on the sternites, the relatively shorter basal segment of the forceps and the stouter, less divergent lobes of the penis. *E. natalensis*, which is abundant in Lake Nyasa, also occurs in Lake Victoria. There are in the Brit. Mus. (N.H.) two males from Entebbe, 11–12.viii.1911, (*C. C. Gowdey*), the specimens referred to as *Ephemera* sp. by Eaton in 1913.

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THE MOSQUITOES OF ARABIA. I

P. F. MATTINGLY
AND
K. L. KNIGHT

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 4 No. 3
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Pp. 89–141 ; 4 *Text-figures*

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THE MOSQUITOES OF ARABIA. I

By P. F. MATTINGLY

AND

K. L. KNIGHT, CMDR. U.S.N.

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SYNOPSIS

Forty-six species, subspecies and varieties of mosquitoes have so far been found in the Arabian area. Five of these, *Anopheles demeilloni*, *Aëdes caballus* and *Culex arbieeni*, *duttoni* and *pipiens* var. *molestus*, are here recorded for the first time from the area. A small number of species previously recorded are considered to have been misidentified. The taxonomic position of a few others is reassessed. Keys to all the species are included and these have been extended to include three species of *Anopheles* which are not certainly known to occur in the area but may possibly do so. All available distribution records are included together with a list of the localities concerned and their approximate altitudes, latitudes and longitudes. The zoogeography of the fauna is discussed and the conclusion is reached that it is mainly Palaearctic with a very small Oriental element, largely confined to the coasts of the Persian Gulf and the Gulf of Oman, and a larger Ethiopian element confined to the south-western corner.

INTRODUCTION

UNTIL recently our knowledge of the Arabian mosquitoes has been meagre in the extreme. Until the beginning of the second world war it was based mainly on small collections made many years ago in Oman, the Western Aden Protectorate and the island of Bahrein. Since that time, however, more abundant material has become available from the Eastern Aden Protectorate, Trucial Oman and the Yemen. Fortunately a number of representative specimens from the earlier collections have been preserved in the British Museum and the recent collections are well represented both there and in the United States National Museum. The London School of Hygiene also has an important collection. All these collections have been available to us for

study as well as a small but important collection from Socotra kindly lent to us by the Berlin University Museum. For the purpose of the present paper the Arabian area is arbitrarily defined as including the whole of the Arabian peninsula, south of Palestine, Sinai, Irak and Transjordan, together with the immediately adjacent islands and the island of Socotra. Records are available from all the principal political units involved, except Kuwait and Qatar. Despite this fact, however, the whole of northern and central Arabia remain virtually unknown to us. Most of the available records have been published previously, but four species and one variety, listed above in the synopsis, are here recorded for the first time. In view of the fact that three of the species concerned were collected, for the first time in Arabia, after work on the present paper was begun there can be little doubt that a number of other species remain to be discovered.

PROVISIONAL LIST OF SPECIES

The following list is provisional in the sense that the names which it includes are subject to the usual vicissitudes of taxonomic nomenclature and as such are liable to change as our knowledge increases. We are also of the opinion that the status of the Arabian form of any species should be not considered as finally established until the early stages and both sexes of adult are available. In many instances this is still not the case. The most we feel justified in claiming is that each form included in our list represents, to the best of our knowledge, a distinct and recognizable element in the Arabian fauna. In addition to this we have tried, as far as possible, to assess the taxonomic status of the forms concerned although it is clear that in certain cases insufficient material is available to permit any final conclusion to be reached.

Anopheles hyrcanus Pallas and *Anopheles subpictus* Grassi have both been recorded from Arabia, but we have omitted them from our list because we do not consider that their presence there has been conclusively established. Nevertheless both are known to occur in parts of Iran very close to the borders of our area and we have included them in our keys since it seems likely that both will eventually be found in eastern Arabia. Similarly we have included *Anopheles superpictus* in our keys since it seems almost certain that it will ultimately be found in northern Arabia. Unrecorded culicine species which we feel may yet be encountered are not included in our keys, but they are mentioned below under Zoogeography (p. 130). *Anopheles arabicus* Christophers & Chand, *Culex jenkinsi* Knight and *Culex arabicus* Becker have been synonymized by us with *Anopheles fluviatilis*, *Culex arbieeni* and *Aëdes caspius* respectively. *Anopheles theobaldi* Giles was recorded provisionally by Buxton (1944 : 212) but examination of the specimens in question has shown them to be *Anopheles pretoriensis*. It seems highly unlikely that *An. theobaldi* will be encountered in Arabia. From our recently acquired knowledge of variation in *An. dthali* in the Eastern Aden Protectorate it does not seem that var. *wardi* Leeson & Theodor (1948 : 222) is constantly distinguishable from the type form and we have provisionally discarded this name since it does not appear to us to serve any useful purpose. *Anopheles macmahoni* Evans was recorded from the Western Aden Protectorate by Buxton (1944 : 213) and Petrie & Seal (1943 : 63). We have seen the larvae in question

and consider them to be those of *An. sergenti* of which *An. macmahoni* is, in our view, a subspecies probably mainly confined to the African portion of the Somali-Arid District. The latter is therefore omitted from our list. *Culex thalassius* Theobald was recorded from Socotra by Leeson and Theodor (1948 : 228) but examination of the specimens concerned shows them to be *C. tritaeniorhynchus* and *C. sitiens*. We have no evidence of the occurrence of *C. thalassius* in the Arabian area and it is therefore omitted from our list. The following species and infraspecific forms are provisionally recognized by us as occurring in the Arabian area.

Genus ***ANOPHELES*** Meigen

1. *Anopheles* (*Anopheles*) *coustani* Laveran.
2. *Anopheles* (*Anopheles*) *coustani* var. *tenebrosus* Dönitz.
3. *Anopheles* (*Myzomyia*) *cinereus* Theobald.
4. *Anopheles* (*Myzomyia*) *culicifacies* Giles.
5. *Anopheles* (*Myzomyia*) *culicifacies* ssp. *adenensis* Christophers.
6. *Anopheles* (*Myzomyia*) *demeilloni* Evans.
7. *Anopheles* (*Myzomyia*) *dthali* Patton.
8. *Anopheles* (*Myzomyia*) *fluviatilis* James.
9. *Anopheles* (*Myzomyia*) *gambiae* Giles.
10. *Anopheles* (*Myzomyia*) *multicolor* Cambouliou.
11. *Anopheles* (*Myzomyia*) *pharoensis* Theobald.
12. *Anopheles* (*Myzomyia*) *pretoriensis* (Theobald).
13. *Anopheles* (*Myzomyia*) *pulcherrimus* Theobald.
14. *Anopheles* (*Myzomyia*) *rhodesiensis* ssp. *rupicolus* Lewis.
15. *Anopheles* (*Myzomyia*) *sergenti* Theobald.
16. *Anopheles* (*Myzomyia*) *stephensi* Liston.
17. *Anopheles* (*Myzomyia*) *turkhudi* Liston.

Genus ***CULISETA*** Felt

18. *Culiseta* (*Allotheobaldia*) *longiareolata* (Macquart).

Genus ***AËDES*** Meigen

19. *Aëdes* (*Ochlerotatus*) *caballus* Theobald.
20. *Aëdes* (*Ochlerotatus*) *caspius* Pallas.
21. *Aëdes* (*Stegomyia*) *aegypti* Linnaeus.
22. *Aëdes* (*Stegomyia*) *granti* Theobald.
23. *Aëdes* (*Stegomyia*) *vittatus* Bigot.
24. *Aëdes* (*Aëdimorphus*) *arabiensis* (Patton).
25. *Aëdes* (*Aëdimorphus*) *hirsutus* var. *adenensis* Edwards.
26. *Aëdes* (*Aëdimorphus*) *natronius* Edwards.

Genus ***CULEX*** Linnaeus

27. *Culex* (*Lutzia*) *tigripes* de Grandpré & de Charmoy.
28. *Culex* (*Neoculex*) *arbieeni* Salem.
29. *Culex* (*Neoculex*) *salisburiensis* Theobald.
30. *Culex* (? *Neoculex*) sp. indet.
31. *Culex* (*Culiciomyia*) *nebulosus* Theobald.
32. *Culex* (*Barraudius*) *pusillus* Macquart.
33. *Culex* (*Culex*) *decens* Theobald.
34. *Culex* (*Culex*) *duttoni* Theobald.
35. *Culex* (*Culex*) *ethiopicus* Edwards.
36. *Culex* (*Culex*) *laticinctus* Edwards.
37. *Culex* (*Culex*) *mattinglyi* Knight.
38. *Culex* (*Culex*) *pipiens* Linnaeus.
39. *Culex* (*Culex*) *pipiens* ssp. *fatigans* Wiedemann.
40. *Culex* (*Culex*) *pipiens* var. *molestus* Forskal.
41. *Culex* (*Culex*) *simpsoni* Theobald.
42. *Culex* (*Culex*) *sinaiticus* Kirkpatrick.
43. *Culex* (*Culex*) *sitiens* Wiedemann.
44. *Culex* (*Culex*) *theileri* Theobald.
45. *Culex* (*Culex*) *tritaeniorhynchus* Giles.
46. *Culex* (*Culex*) *univittatus* Theobald.

NOTES ON TAXONOMY

Anopheles coustani. Records by Leeson (1948 : 254) were based on larval material only and so could not be assigned as between the type form and varieties. However, adults from the same part of Arabia, in the U.S. National Museum, are var. *tenebrosus* and Leeson's records may therefore be provisionally assigned to this form. No other variety is known from eastern Arabia. The record from western Arabia can be attributed with certainty to the type form because it is based on a female adult. *Anopheles hyrcanus* was recorded from eastern Saudi Arabia (Hoffuf) by Leeson (1948 : 254), but this record was based only on one 4th stage and several earlier instar larvae. On the character of the inner shoulder hair, which has 4–5 branches arising from half way and beyond, the fourth stage larva resembles *An. hyrcanus*, but this character has been found to be unreliable (Lumsden, in Leeson *et al.*, 1950 : 81). The pecten has 10 long teeth and on this character, which has not previously been used for diagnosis but which works well in the material available to us, it resembles *An. coustani*. In our material *An. hyrcanus* has 9 long teeth at most (fig. 2*f*). The antennal shaft hair is very small and this also suggests *An. coustani* although it is not conclusive. On these characters and having regard to the specimens from adjacent areas an attribution to *An. coustani* var. *tenebrosus* seems more reasonable. As noted by Buxton (1944 : 211) the specimen from Dhufar is very worn, but we see no reason to question Evan's attribution to var. *tenebrosus*.

Anopheles hyrcanus. See above under *An. coustani*.

Anopheles cinereus. Leeson (1948 : 254) provisionally attributed one larva (from

among a batch of *An. multicolor* and *An. stephensi*) from Hoffuf to *An. cinereus*. We cannot accept this attribution since the larva in question has mouthbrushes of normal Anopheline type while those of *An. cinereus*, like those of *A. turkhudi*, are exceptional in that they project laterally from the clypeus in a manner reminiscent of the Culicini. Apart from the presence of three small rami on the anteroventral mesopleural bristle of one side (the mesopleural bristles of the other side are missing) this seems to be a typical larva of *An. multicolor*. We can feel no doubt that it is an aberrant larva of that species. It may be remarked that *An. culicifacies adenensis* and *An. dthali* are both on record as showing a similar aberration. De Meillon (1947 : 211) notes that, in general, South African *An. cinereus* have the third tarsal bands relatively broad while in East African specimens they are narrower. Specimens from Asir and the Western Aden Protectorate have the bands very inconspicuous, but in specimens from the Yemen they are distinct. Gill (1916 : 207) has a record of this species from Muscat, but states that it is open to question since only a partial description was available to him. We have been unable to ascertain the identity of the specimen in question since we have no specimens. Specimens may have been preserved in the Malaria Institute of India. The British Museum has one male and one female adult marked "Aden Hinterland, Lt. Patton ". One of us (P. F. M.) has marked the female as hololectotype and the male as allolectotype of *Anopheles jehafi* Patton. The possibility of confusion between *An. cinereus* and *An. hispaniola* in N.W. Saudi Arabia is discussed below (p. 130).

Anopheles culicifacies. This species was formerly on record from the Western Aden Protectorate (Christophers & Chand, 1915 : 186). Later Christophers (1924 : 296) distinguished the form in question as var. *adenensis*. Leeson & Theodor (1948 : 225) noted variation in one of the distinguishing characters described by Christophers and these authors retained the varietal rank. De Meillon (1947 : 100) accorded the Aden form specific status, but with considerable hesitation. Since the two forms appear to be geographically representative it has seemed more reasonable to us to treat them provisionally as subspecies. The record by Leeson (1948 : 254) from Oman suggests that the two forms may overlap there and that it would perhaps be the best area in which to study their relationship. De Meillon (1947 : 98) figures a larva of ssp. *adenensis* from Assab, Eritrea with one of the long mesopleural bristles split distally. We have no record of such an aberration in Arabian material, but we have allowed for it in our key.

Anopheles demeilloni. The present records are the first from Arabia. The record from W. Aden Protectorate is based on a unique female adult (in spirit, but in good condition) and some larvae. That from the Yemen is based on one female and two males, previously published as *An. fluviatilis* (Knight, 1953*b* : 220). Adults from both areas resemble the East African rather than the South African form in having the base of the costa entirely dark (see Evans, 1938 : 266 ; De Meillon, 1947 : 177).

Anopheles dthali. This was recorded fom Muscat and Aden as *An. rhodesiensis* by Christophers & Chand (1915 : 182) and Gill (1916 : 207). Conversely *An. rhodesiensis rupicolus* was reported from the Yemen as *An. dthali* by Buxton (1944 : 211). The two species are, however, easily separated on the character of the head scales and pharynx (Christophers & Puri, 1931*b* : 1133 ; Evans, 1938 : 249). Leeson & Thedor

(1948 : 222) distinguished the Socotra form as var. *wardi*. The characters which they studied appear to show random variation in material from the Eastern Aden Protectorate and we have therefore discarded the varietal name. Light feathering of the anteroventral mesopleural seta of one side only is recorded as an aberration by Puri (1931 : 147). and De Meillon (1947 : 109).

Anopheles fluviatilis. *Anopheles arabicus* Christophers & Chand (1915 : 189) appears to us to be synonymous with the present species. The principal difference between the two is the possibly more frequent occurrence in *An. arabicus* of a pale interruption in the basal dark area of the costa. However, Christophers and Chand (*loc. cit.*) noted the occurrence of such a pale interruption in about 5% of the Indian specimens of *An. fluviatilis* available to them while Ramakrishnan (quoted by Macan in Leeson *et al.*, 1950 : 211) found it in only 1–2% of his specimens of " *An. arabicus* " in southern Irak. The two Iranian specimens in the British Museum are intermediate, each having the interruption present on one wing only and reduced to 1–2 pale scales. We have not seen any larvae of *An. arabicus* but from the descriptions given by Christophers and Chand and by Christophers and Puri (1931*a* : 486) they appear to be indistinguishable from those of Indian *An. fluviatilis*. *An. fluviatilis* has been recorded from the Yemen (Knight, 1953*b* : 220), but it is now considered that the species in question was *An. demeilloni*. An. *fluviatilis* is unlikely to be found in western Arabia.

Anopheles gambiae. This was probably the species recorded as *An. subpictus* from the fortress of Aden by Phipson (1934 : 46) although, as far as is known, no material was preserved. The species is recorded as breeding in the smaller accessory (water) tanks and as being the only one found breeding in the fortress.

Anopheles multicolor. See above under *An. cinereus*.

Anopheles pretoriensis. Specimens from the Aden hinterland formerly placed under *An. theobaldi* in the British Museum and queried by Buxton (1944 : 212) are undoubtedly *An. pretoriensis*. They appear to be part of the original material of *Anopheles tibani* Patton (1905 : 629) and comprise one male and one female adult with the data " Arabia, Aden Hinterland, Capt. W. S. Patton ". These are the only specimens of *An. tibani* known to have been preserved. One of us (P. F. M.) has marked the female as hololectotype and the male as allolectotype of that species.

Anopheles rhodesiensis. De Meillon (1947 : 97) notes that it is doubtful whether this is specifically distinct from *An. rupicolus* Lewis. In our view it is not, and we have preferred to treat them provisionally as subspecies. A similar opinion has been expressed to one of us (P. F. M.) by Mr. Lewis. As previously noted (Knight, 1953*b* : 221) female adults from the Yemen would run to *An. rhodesiensis* on recent keys (De Meillon, 1947 : 21, 1949 : 467). They differ from the typical form of that species, however, in having only two well-marked spots on the costa. It is probable that the principal meeting place of the two forms is Abyssinia, from which there are numerous records (some still unpublished). Their relationship will be discussed more fully by one of us (P. F. M.) in a paper on the mosquitoes of Abyssinia which is at present in preparation. Larval differences between the two forms are not reliable (De Meillon, *loc. cit.*). Larvae from Wadi Duan have much darker heads than those from the Yemen (though still with the dark spots on the fronto-clypeus non-confluent and

relatively inconspicuous). They vary in the degree of development of the long spicules at the base of the antenna and the size of the tubercle at the base of the inner shoulder hair and are rather liable to be confused with those of *An. demeilloni* or *A. sergenti*. However, they can be recognised from the former by their fronto-clypeal markings and from the latter by their smaller tergal plates. The fact that this was the species published by Buxton (1944 : 211) as *An. dthali* from Ta'izz has been established by examination of a slide of the female pharynx and another of the male terminalia preserved at the London School of Hygiene and is confirmed by the subsequent discovery of *An. rhodesiensis rupicolus* in the same locality (Knight, 1953*b* : 221). Earlier confusion between the two species has been noted above under *An. dthali*.

Anopheles sergenti. This species and *Anopheles macmahoni* Evans (1936 : 538) are so closely similar that in our view they should be treated as subspecies. Aside from the variable characters in wing and larva mentioned below, the principal difference is in the female pharynx. In the type form of *An. sergenti* (from Algeria and Transjordan) the central processes on the post-pharyngeal ridges are short and very delicate, while the rods taper uniformly to form long, delicate terminal filaments. The only female of *An. macmahoni* at present available to us is a paratype in the British Museum and we are unwilling to dissect this. It is, however, perfectly clear from the description and figure of *An. macmahoni* given by De Meillon (1947 : 187 and plate 66) that in this form the median processes on the first row of post-pharyngeal ridges are much longer and stouter, while the rods lack the terminal filament or have only a very short one. Arabian specimens (from Jeddah and Tarim) are intermediate with respect to the terminal filaments of the rods, which are short and somewhat asymmetrical, while the median processes on the post-pharyngeal ridges are considerably shorter and more delicate than in *An. macmahoni*. (In the specimen from Jeddah they are somewhat longer and stouter than in specimens from Tarim, which more or less resemble type form *sergenti*). In our view these pharyngeal differences would not justify us in distinguishing *An. macmahoni* as a subspecies since there is clear evidence of intergrading. The latter differs sharply from *An. sergenti*, however, in the condition of the third vein of the wing. This is constantly dark except at base and extreme tip over the wide range of specimens of *An. sergenti* available to us (Christophers, 1933 : 195, mentions " an indistinct palish area about middle " as being sometimes shown), whereas in *An. macmahoni* it appears that it is normally extensively pale scaled in the middle and only exceptionally dark. De Meillon shows the 4th vein of *An. macmahoni* as pale, but it is exactly as in *An. sergenti* in our paratypes. The larva of ssp. *macmahoni* is much more variable than that of *An. sergenti* with respect to the tergal plates. Evans (1938 : 290) states that on segment V of the abdomen their width varies from about three-quarters of the distance between the palmate hairs to about equal to this distance and that the anterior accessory tergal plate may sometimes be partly included in the posterior border of the main tergal plate, while Giaquinto-Mira (1950 : 294) describes a form from Abyssinia (" var. *barkhuusi* ") in which the tergal plates may be even wider and the anterior accessory plate is completely enclosed in the main plate. In our view these variations, none of which are known to occur in *An. sergenti* s.str., in which the

maximum width of the tergal plates on segment V is about four-fifths of the distance between the palmate hairs, justify us in maintaining *An. macmahoni* as a subspecies. It is apparently entirely confined to the African portion of the Somali Arid District and certain mountains in the southern Anglo-Egyptian Sudan. Since it is not known to occur in Arabia we have omitted it from our keys, Should it occur then larvae might be liable to confusion with those of *An. fluviatilis*, to which they would run on our key. They could, however, at once be distinguished by the branched anteroventral mesopleural hair. Adults might be inseparable from those of *An. adenensis* and it would be as well to confirm records of this species from larvae wherever possible. Slight variation occurs in the markings of legs and male palps in *An. sergenti* (Knight, 1953*b* : 223), but it appears to have no taxonomic significance. Variation in the larva is more pronounced. Most larvae from the Aden Protectorate have the accessory tergal plates suppressed, a feature also observed in larvae from Iran and Palestine and noted by Puri (1931 : 167) for larvae from Waziristan. Buxton (1944 : 213) and Petrie & Seal (1943 : 63) recorded larvae of " *An. macmahoni*" from the Western Aden Protectorate, but these larvae show no difference from others of the type form, to which we have therefore assigned them. Variation in larval head markings is shown as between specimens from Tarim and Shibam and those from Wadi Natid respectively but this falls within the range described by Saliternik (1955) in Palestine and is probably associated with variation in background colour in the breeding places.

Anopheles subpictus. See above under *An. gambiae.*

Anopheles superpictus. As already noted, this species has not been recorded from Arabia. It has, however, been found in Transjordan and in southern Irak and may well occur in the northern part of our area. In view of its importance as a malaria vector it has been thought desirable to include it in our keys.

Anopheles turkhudi. Evans (1938 : 249) notes the possibility that males of this species may be confused with those of *An. dthali* or *An. rhodesiensis.* It may also be noted that several of the characters which she herself lists as diagnostic from *An. cinereus* are variable in the latter species. The possibility of confusion between this species and *An. hispaniola* in N.W. Saudi Arabia is discussed below (p. 130).

Culiseta longiareolata. Edwards (1941 : 69) noted two types of variation as broadly characteristic of Mediterranean (and Somali Arid) and South African specimens respectively. As previously noted by one of us (Knight, 1953*b* : 224), however, nearly the whole range of variation is shown by specimens from the Yemen.

Aëdes caballus. The records given below are based on four female adults, and as they are the first from Arabia they require confirmation. So far as can be seen, however, the specimens seem typical and the distribution is certainly a very likely one.

Aëdes caspius. The record from Hoffuf is a conjectural one based on the data label of the slide of " *Anopheles* ? *cinereus* " discussed above. This label states that the specimen in question was found together with *An. multicolor, An. stephensi, Cu. pipiens* and " *Aëdes mariae* ". We have no record of the last named from Arabia or from anywhere near the boundaries of our area. In view of the close resemblance of its larva to that of *Aëdes caspius* and the fact that the latter has been found in the

same general area the present attribution seems a reasonable one. Edwards (1921 : 299, 1932 : 141) placed *Culex arabicus* Becker, from Socotra, in the synonymy of *Aëdes caspius*. Later, however, (1941 : 353) he preferred to treat it as a species of uncertain position by reason of its simple hind tarsal claws. Examination of the type

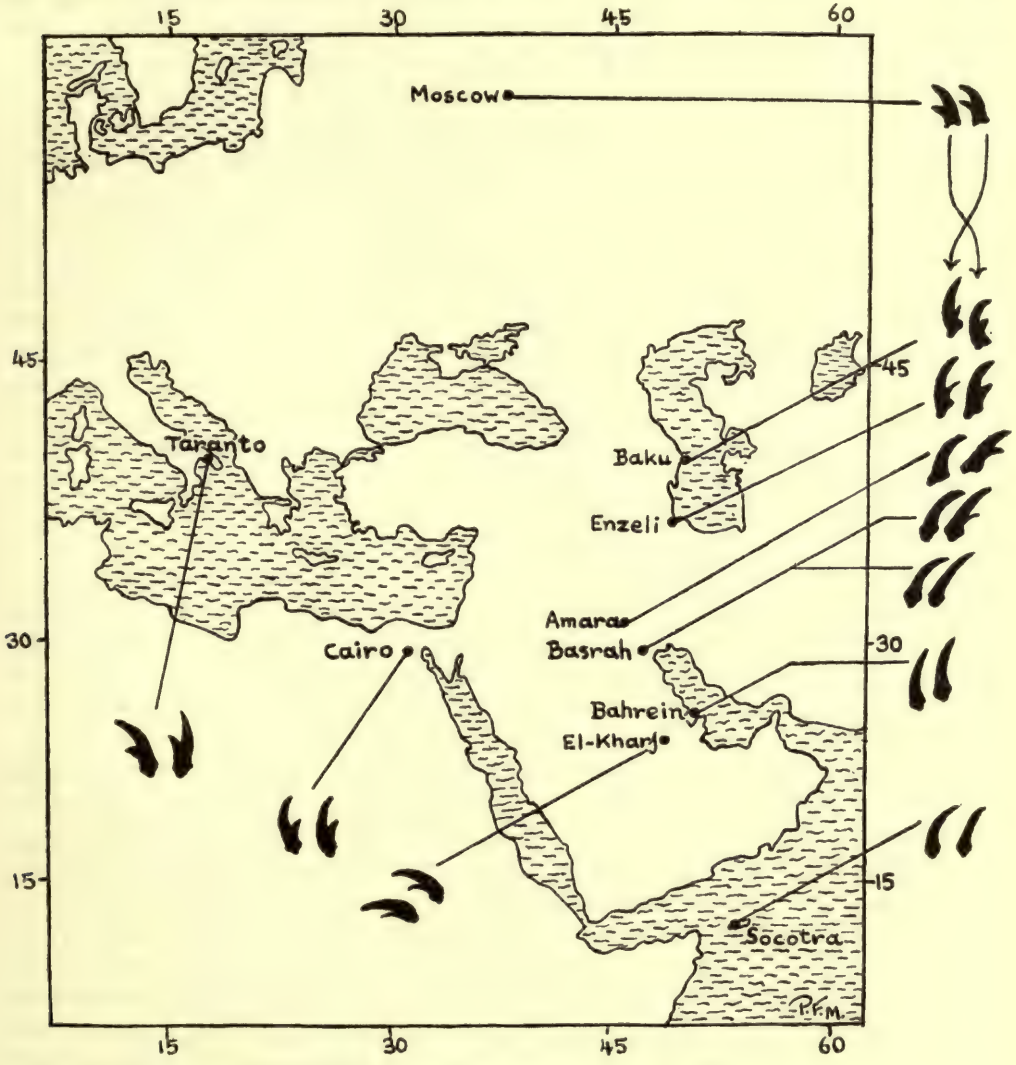

FIG. 1.—Clinal variation in female hind claws of *Aëdes caspius*.

of *Cu. arabicus*, kindly loaned to us by Professor Peus of the Berlin Museum, shows that in other characters it resembles *Aëdes caspius* while examination of a number of specimens of the latter from various parts of its range shows that variation in the hind claws is continuous and apparently clinal (Text-fig. 1.). Specimens from the Mediterranean area (Italy, Macedonia, Palestine, Egypt) have both hind claws strongly

toothed. Others from the area of the type locality (Caspian Sea) have both claws toothed, but the tooth on one of them is markedly reduced. A specimen from Amara, Irak, has this claw entirely simple, the other still being strongly toothed. In specimens from Basrah one claw is simple and the tooth on the other is either greatly reduced or absent. All specimens from the Arabian area examined by us show the extreme degree of reduction with both claws entirely simple except that an inland specimen from El-Kharj (about 1,000 ft.) has both claws with delicate teeth, suggesting that a temperature effect is involved. Since this variation is apparently continuous it does not seem to us worth while preserving the name *arabicus*. Should it later seem desirable to do so we may point out that the name is, in any case, preoccupied for *Aëdes* by *Mansonia arabica* Giles (1906 : 130), which was applied to the form of *Aë. caspius* occurring on Bahrein.

Aëdes aegypti. Two forms of this species occur in the Arabian area, a pale form and a dark form. They interbreed readily in the laboratory, and from the fact that numerous intermediates are found wherever they occur together it seems certain that they also interbreed in nature. Their distribution and bionomics are discussed below under Zoogeography (p. 135). Edwards (1941 : 476) lists the pale form under the name " var. *queenslandensis* Theobald ", but this is not legitimate since it is clear from the facts of distribution and from Linnaeus' original description that the pale form is in fact the type form. Although they have been introduced into many parts of the world by Man both forms show a marked reluctance to spread beyond their point of introduction (Mattingly, 1953*a* : 46 ; Reid, 1954 : 164) and their relative distribution in any given area can therefore be mapped with reasonable accuracy. Thus it appears reasonable to name them as subspecies, and study of their distribution on a world basis is being made with this end in view. This is, however, still not completed and for the purposes of the present paper both are referred to under the name " *Aëdes aegypti* ". The two forms show certain interesting biological differences which are discussed below (p. 136).

Aëdes granti. The taxonomic position of this remarkable species has been discussed by Mattingly (1953*b* : 17) and Marks (1954 : 353). It is intermediate in its characters between the *Aëdes scutellaris* Walker and *Aëdes albopictus* Skuse groups of *Stegomyia*. The male terminalia were recently figured for the first time by Mattingly (1954 : 268). The type locality (Dahamis Glen, i.e. Wadi Dahamis) has not been published before. It is recorded on the data label of the type and is described by Forbes (1903 : xxxvi).

Aëdes vittatus. Unassociated larvae from Awabil, provisionally ascribed to this species, have an unusually number of bifid or even, occasionally, trifid comb spines (Text-fig. 3*a* shows an extreme example). A similar aberration is known from other parts of the range (e.g. the Anglo-Egyptian Sudan) though to a much smaller extent. This is an interesting convergence towards *Aë. hirsutus* and might cause confusion were it not that the latter has head seta 6 (C) multibranched. In *Aë. vittatus* this seta is usually plumose (*pace* Hopkins, 1952 : 160, who describes it as simple). The larva ascribed by Hopkins (1952 : 178) to *Aë. minutus* Theobald and others similarly attributed by one of us (P. F. M.) in a footnote to Hopkins' description are in fact *Aë. vittatus*. The true larva of *Aë. minutus* has been found by Mr. Muspratt in South Africa and is quite different. The character of the entirely smooth antenna used by

Hopkins (1952 : 117) for keying "*Aë. minutus*" is now known to occur also in *Aë. vittatus*.

Aëdes arabiensis. This is very closely related to the holarctic, Oriental and Australasian *Aë. vexans* Meigen, of which it is possibly no more than a subspecies (see Edwards, 1941 : 195).

Aëdes hirsutus var. adenensis. The description of the type series by Edwards (1941 : 198) is incorrect. It consists of 2 ♀ from about 7,100 ft. on Jebel Jehaf and 1 ♂ and 7 ♀ from Dhala (Dthala). One of us (Mattingly, 1955*c*) has recently marked a Jebel Jehaf specimen as hololectotype. Edwards did not describe the male terminalia. They are indistinguishable from those of the type form.

Aëdes natronius. Previous descriptions by Edwards (1941 : 199) and Hopkins (1952 : 205) are misleading (see Knight, 1953*b* : 224).

Culex tigripes. We have seen specimens from all the localities listed below and all resemble variant 5 of Edwards (1941 : 249).

Culex arbieeni. The Yemen adults were described by Knight (1953*a* : 323) as *C. jenkinsi* sp. n. The larva provisionally attributed to the latter (Knight, 1953*b* : 225) is quite unlike that of *C. arbieeni* and is here treated as "*Culex* sp. indet." The synonymy of *C. arbieeni* is discussed in detail by Mattingly (1955*b* : 381).

Culex salisburiensis. The discription of the male terminalia by Edwards (1941 : 258 and fig. 83*a*) is misleading. They were redescribed by Knight (1953*b* : 226 and fig. 2). The Yemen specimens are of the type form. Var. *capensis* De Meillon (1935 : 354) was not recognized by Edwards but it is almost certainly a good subspecies. The close resemblance of this species to *Culex deserticola* Kirkpatrick requires emphasis, as the latter may well be found in northern Arabia.

Culex (? *Neoculex*) sp. indet. The larva of this species was provisionally attributed by Knight (1953*b* : 225) to *Culex jenkinsi*. As noted above, this species is now known to be synonymous with *Culex arbieeni* which has a highly characteristic larva quite different from the present one (see Hopkins, 1952 : 251 and fig. 142). The present larva differs in important respects from all the known Palaearctic and Ethiopian larvae of the genus *Culex*. The characteristics of the head setae, siphon and pecten teeth suggest that it may be a *Neoculex* though this is uncertain. Many of the Ethiopian *Neoculex* have unknown larvae as does a Palaearctic species from Baluchistan recently described by one of us (Mattingly, 1955*b*). The identity of the present species must therefore remain uncertain until adults with associated larval skins can be obtained.

Culex pusillus. This species, so far as is known, is entirely confined to the Mediterranean subregion. It is placed in a distinct subgenus together with *Culex modestus* Ficalbi, which has a more northerly distribution and is, perhaps, not very likely to be found in Arabia. The resemblances between this small subgenus and *Lutzia*, noted by Edwards (1921 : 332), are interesting.

Culex nebulosus. The only Arabian record of this very common peridomestic Ethiopian species is based on a unique male adult intermediate in its characters between *C. nebulosus* s.str. and *C. nebulosus* var. *pseudocinereus* Theobald (see Knight, 1953*b* : 228).

Culex duttoni. This is another very common peridomestic species on the African

mainland. The only record from Arabia is based on two whole larvae and it requiers confirmation, since these larvae are apparently indistinguishable from those of *Culex watti* Edwards. The attribution to *C. duttoni* is based mainly on the fact that it seems to be very much the commoner of the two species, but this impression may be due in part to the fact that *C. watti* has only recently been recognized as a distinct species (Edwards, 1941 : 302) and it is very desirable that records should be confirmed wherever possible by breeding out. The affinities of *C. duttoni* and *C. watti* have until recently been very obscure, but the recent descovery by Mr. Donald Colless of the larva of *Culex hutchinsoni* Barraud reveals that this species is closely related to them. There are also striking resemblances in the male terminalia. *C. hutchinsoni* is known only from Assam and Malaya.

Culex laticinctus. Specimens from San'a and Dhahran published by Edwards (1941 : 314) under this name proved on dissection of the male terminalia to be *Culex mattinglyi.* Specimens from Ta'izz and Hadibo have prealar scales (except as a rule in the male). The same is true of most Mediterranean specimens, although our series from Muscat lacks them. Ethiopian specimens from the African mainland seem generally to lack them (Edwards, 1941 : 313) and it seems that a temperature effect may be involved.

Culex mattinglyi. See above under *C. laticinctus.*

Culex pipiens. The MS. record from Hoffuf is based on the data label of the slide of "*Anopheles cinereus*" discussed above under that species and *Aëdes caspius.* The status of the form here referred to as ssp. *fatigans* (*quinquefasciatus* Say of many authors) is the subject of some disagreement. The subspecific status has been conferred by reason of the fact that this and the type form cross readily in the laboratory and that attempts to demonstrate any natural barrier to hybridization have so far failed (Rozeboom in Mattingly *et al.*, 1951 : 343). The distribution of intermediate forms (? hybrids) has been the subject of a recent study by Dr. A. R. Barr of the University of Minnesota, the results of which are, it is understood, to be published shortly. In the interim it seems desirable to point out a fact which has hitherto escaped comment and this is that a number of recent publications on North American mosquitoes show figures of the male terminalia of "*Culex pipiens*" which are, in fact, intermediate between those of *C. pipiens pipiens* and *C. pipiens fatigans* and seem indistinguishable from those of F_1 laboratory hybrids. Good examples are Yamaguti & LaCasse (1951 : 46, plate XV) and Carpenter *et al.*, (1946 : 246, fig. 135). It cannot therefore be doubted that there exist in the southern United States a naturally occurring form or forms morphologically indistinguishable from *C. pipiens-fatigans* hybrids. The only other part of the world where this is known to be the case is the Sino-Japanese area. The intermediate form occurring there is known as *C. pipiens* var. *pallens* Coquillett. That the form occurring in the southern United States is either an introduced or a relict *C. pipiens* var. *pallens* is possible, but that such a form could exist side by side with *C. pipiens pipiens, C. p. var. molestus* and *C. p. fatigans* without hybridization taking place seems improbable. This is especially so in view of the natural hybridization between *C. pipiens* var. *molestus* and *C. p. fatigans* which followed on the recent introduction of the former into southern Australia (Drummond in Mattingly *et al.*, 1951 : 369). No forms which are clearly of

the hybrid type have as yet been found in either the Ethiopian Region or the Mediterranean Subregion but the material available from areas where the ranges of *C. pipiens* and ssp. *fatigans* overlap is at present very scanty. In Arabia var. *molestus* and ssp. *fatigans* appear to occur together in the Jedda area and the same applies to the type form and ssp. *fatigans* in Trucial Oman. These might therefore be good areas in which to study the problem.

The status of *C. pipiens* var. *molestus* has also been the subject of controversy. Although differing morphologically and biologically from other forms it crosses readily, at least with ssp. *fatigans*. Its biological characteristics are not constant and it appears to intergrade with the type form with respect to morphological characters in the Mediterranean area (Edwards, 1921 : 346) and the Anglo-Egyptian Sudan Lewis, 1945 : 17). The British Museum has a series of male adults from Jedda which agree with var. *molestus* in their very pale colour and short palps (from 0·9 to just over 1·0 times the length of the proboscis, including labellum). On the basis of these specimens we feel justified in provisionally including var. *molestus* in the Arabian list. This variety appears to be the dominant form around the shores of the Mediterranean (where it is sometimes referred to as var. *berbericus* Roubaud or var. *autogenicus* Roubaud), although the type form also occurs there sporadically and probably replaces it entirely at high altitude. The taxonomic status of the various members of the *Culex pipiens* complex has been discussed by Mattingly *et al.* (1951) and Knight and Abdel Malek (1951) have given a full account of the morphological and biological characteristics of a topotypical form of *C. pipiens* var. *molestus* from Cairo.

Culex simpsoni. The description of the larva by Hopkins (1952 : 293) is misleading (see Mattingly & Brown, 1955 : 85 and 105). The principal diagnostic character from *Culex sinaiticus* is provided by the relative length of the pecten. It is possible that in parts of the joint range of the two species this character may prove unreliable, but the pecten is perceptibly shorter in *C. simpsoni* in all the material available to us. Characters for the separation of the adults of these species used by Edwards (1941 : 286) have also proved unreliable and it seems that in S.W. Arabia they are inseparable on external characters. This point is further discussed, under *C. sinaiticus*, below.

Culex sinaiticus. Adults of both sexes from the Eastern and Western Aden Protectorates and from Socotra have dark as well as light scales on the front coxae and relatively extensive dark scaling at the apices of some of the posterior abdominal sternites. Their scutal ornamentation is closely similar to that of *Culex simpsoni* from the Yemen. In this area, therefore, the two species cannot be separated on the characters used by Edwards (1941 : 286) in his key and they appear to be distinguishable only on the characters of the male palps and terminalia. The unique male from Muscat in the British Museum, which is our only specimen from Oman, runs down satisfactorily on Edwards' key and the same seems likely to be true of other *C. sinaiticus* from the northern and eastern parts of Arabia, although more material would be necessary to confirm this and to justify us in naming the darker form as a subspecies.

Culex sitiens. Although *Culex annulus* Theobald is usually regarded as a synonym of *Culex tritaeniorhynchus*, the specimens from Socotra published by Becker (1931 :

140) under the former name are *C. sitiens*. The series in question was kindly loaned to us by Prof. Peus of the Berlin Museum. For a full description of the larva see Knight (1953*b* : 231). Yemen larvae differ from those from an unnamed locality in the Red Sea area keyed by Hopkins (1952 : 248) in having a more extensive pecten, more numerous comb scales (41–58), shorter saddle hair and longer anal papillae. The male terminalia of the Yemen form resemble those figured by Edwards (1941 : 297, fig. 102, *b*, *c*) for the form associated with Hopkins' larvae. The adults also resemble this form in the pale background scaling of the mesonotum. Specimens from Jedda and the Eastern Aden Protectorate resemble the Yemen form in coloration. Those from Socotra are darker but not as dark as the darkest specimens in the British Museum (from Ceylon). The presence of more or less extensive pale scaling on the posterior aspect of the costa appears to be a general feature of Arabian material from all these sources. Specimens from the Eastern Aden Protectorate agree more or less with the Red Sea form in their terminalia, but there is some variation and the differences noted by Edwards between this form and the Madagascar form are, in any event, slighter than his figure would suggest. They appear to amount to little more than variation in the minor spiculation of the lateral plate of the phallosome and to be related to the general degree of darkening and sclerotization of the individual specimen. Larvae from Socotra published by Leeson and Theodor (1948 : 228) as *C. thalassius* are in fact *C. sitiens*. The mistake appears to have arisen from the unjustified use by Hopkins (1952 : 248) of the number of comb scales as a key character.

Culex tritaeniorhynchus. As noted above (p. 93), this species was published from Socotra (by Leeson and Theodor, 1948 : 228) as *C. thalassius*. It was reidentified by one of us (P. F. M.) from male and female adults, male terminalia and a whole larva.

Culex univittatus. Yemen specimens (one male and one female in the British Museum) were formerly assigned by one of us (P. F. M., in Knight 1953*b* : 232) to var. *neavei* Theobald. They are, however, in very poor condition and as the rest of our Arabian material comprises only a few whole larvae we prefer to leave the question of the identity of the Arabian forms open to question. The Yemen male is, however, quite certainly not var. *perexiguus* Theobald, to which the Oman form may be presumed, on distributional grounds, to belong. Var. *perexiguus* is recognizable only on the male terminalia (see Mattingly, 1954 : 56). This form is also likely to be found in north-western Arabia since it is the form occurring in Egypt and Transjordan.

KEYS TO FEMALE ADULTS

The following keys have been carefully checked with the available material and should enable a correct identification to be made in the majority of cases. Where doubt arises reference must be made either to the egg (of *Anopheles*), the female pharynx (of *Anopheles* and *Culex*) or the male terminalia. It is hoped to publish keys to these in a later paper. For the present the reader is referred to the general literature.

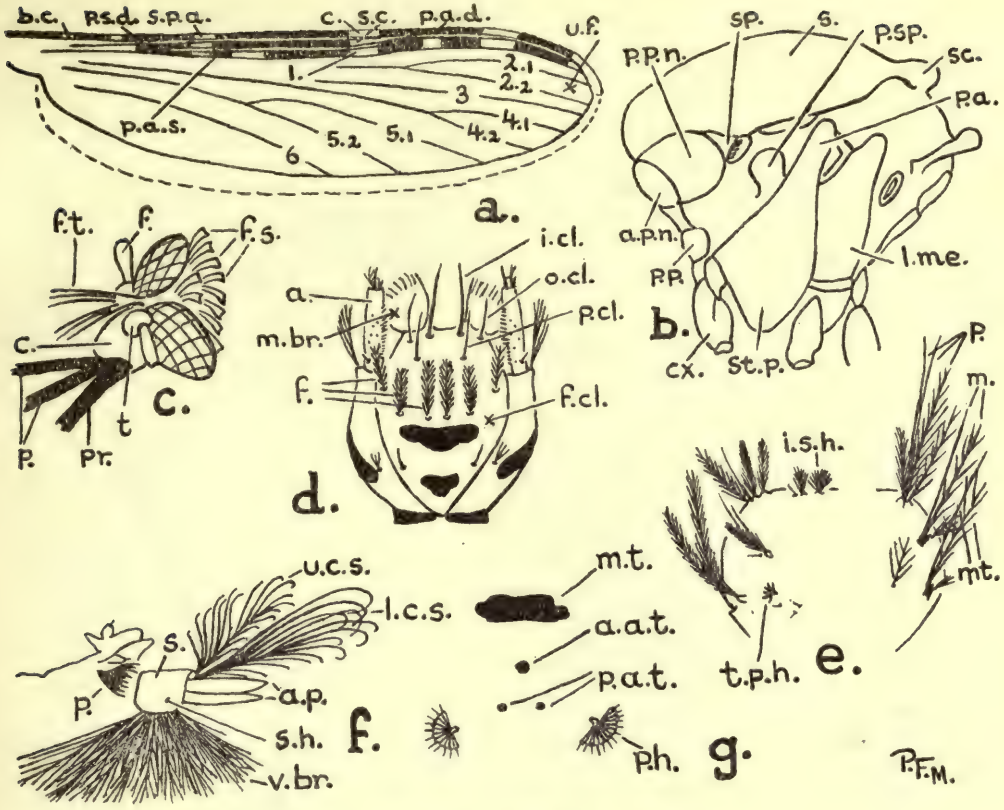

FIG. 2.—Characters employed in the keys.

a. Generalized anopheline wing. *b.c.*, Basal costal interruption ; *c.*, costal vein ; *p.a.d.*, preapical dark spot ; *p.a.s.*, pre-accessory sector spot ; *p.s.d.*, presector dark spot ; *s.c.*, subcostal vein ; *s.p.a.*, sector pale area ; *u.f.*, upper fork cell ; 1–6, First to sixth veins.

b. Generalized thorax in lateral view, showing principal seta- and scale-bearing areas. *a.p.n.*, anterior pronotal ; *cx.*, coxal; *l.me.*, lower mesepimeral ; *p.a.*, prealar ; *p.p.*, propleural ; *p.p.n.*, posterior pronotal ; *p.sp.*, postspiracular ; *s.*, scutal (mesonotal) ; *sc.*, scutellar ; *sp.*, spiracular ; *st.p.*, sternopleural.

c. Anopheline head (diagrammatic). *c.*, Clypeus, *f.*, first segment of antennal flagellum ; *f.s.*, upright forked scales of vertex ; *f.t.*, frontal tuft ; *p.*, bases of palps ; *pr.*, base of proboscis ; *t.*, torus.

d. Head of *Anopheles sergenti* (pale form). *a.*, Antenna ; *f.*, frontal hairs ; *f.cl.*, fronto-clypeus ; *i.cl.*, inner clypeal hair ; *m.br.*, mouth brush ; *o.cl.*, outer clypeal hair ; *p.cl.*, posterior clypeal hair.

e. Generalized thorax of anopheline larva (dorsal on the left, ventral on the right). *i.s.h.*, Inner shoulder hair ; *t.p.h.*, thoracic palmate hair ; *p.*, long propleural bristles ; *m.*, long mesopleural bristles ; *mt.*, long metapleural bristles.

f. Terminal segments of larva of *Anopheles hyrcanus*. *a.p.*, Anal papillae ; *l.c.s.*, lower caudal seta ; *p.*, pecten ; *s.*, saddle ; *s.h.*, saddle hair ; *u.c.s.*, upper caudal seta ; *v.br.*, ventral brush.

g. Fifth abdominal segment of larva of *Anopheles culicifacies adenensis*. *a.a.t.*, Anterior accessory tergal plate ; *m.t.*, main tergal plate ; *p.a.t.*, posterior accessory tergal plates ; *p.h.*, palmate hair.

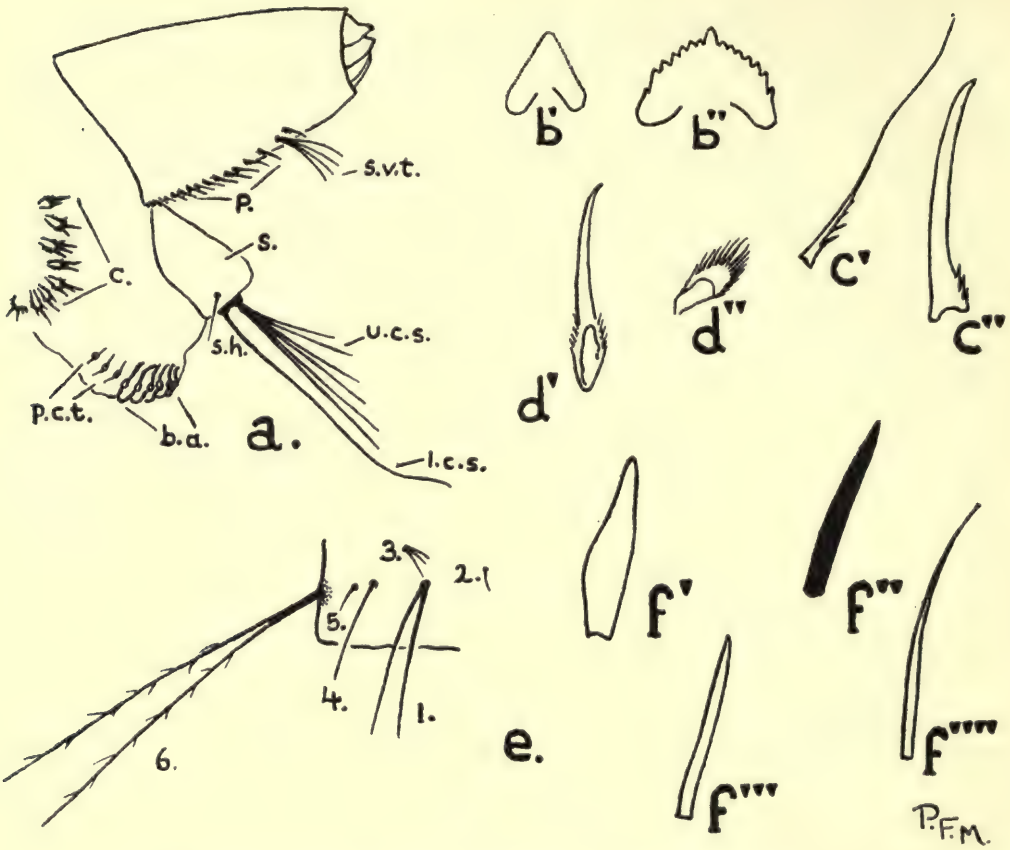

FIG. 3.—Characters employed in the keys (continued).

a. Terminal segments of larva of *Aëdes vittatus* from Awabil showing atypical comb spines. *b.a.*, Barred area of ventral brush ; *c.*, comb ; *l.c.s.*, lower caudal seta ; *p.*, pecten, *p.c.t.*, bases of precratal tufts ; *s.*, saddle ; *s.h.*, saddle hair ; *s.v.t.*, subventral tuft of siphon ; *u.c.s.*, upper caudal seta.

b. Mentum. *b'.*, *Culex ethiopicus* ; *b".*, *Culex theileri.*

c. Terminal pecten teeth. c'., *Aëdes natronius* ; c"., *Culex theileri.*

d. Comb teeth. *d'.*, *Aëdes caballus* ; *d".*, *Aëdes caspius.*

e. Third abdominal segment of larva of *Culex pipiens* (dorsal view). 1., Subdorsal seta ; 6., lateral seta.

f. Pre-clypeal spines. *f'.*, *Culex sitiens* ; *f".*, *Culex tritaeniorhynchus* ; *f"'.*, *Culex laticinctus* ; *f"".*, *Culex pipiens.*

Key to Genera

1. Female palps of the same order of length as the proboscis ; posterior edge of scutellum without conspicuous lobes . . . . . *Anopheles.*
   Female palps at most about one-third the length of the Proboscis, usually less ; scutellum trilobed . . . . . 2.
2. Spiracular bristles present ; scutum with a conspicuous white lyre-shaped marking ; costa entirely white along anterior border ; small dark spots present at bases of forks and in neighbourhood of cross-veins . . . . . *Culiseta.*

Spiracular bristles absent; scutum without such marking (except in *Aë. aegypti* and *Aë. granti*); wings otherwise marked . . . . . 3.

3. Postspiracular bristles present; fore tarsal claws of female toothed (except in *Aë. granti*) . . . . . *Aëdes.*

Postspiracular bristles absent; fore tarsal claws of female simple . . . . *Culex.*

Genus *Anopheles*

1. Fore margin of wing with less than 4 spots involving both costa and vein 1 . . 2.

Fore margin of wing with at least 4 such spots 5

2. Palps with short appressed scales; legs all dark . . . *rhodesiensis* ssp. *rupicolus*

Palps with long semi-erect scales giving them a shaggy appearance; legs with pale markings . . . . . 3.

3. Segment 5 of hind tarsus white . . . . . 4.

Segment 5 of hind tarsus dark . . . . . *hyrcanus.*

4. First hind tarsal segment with well-marked pale basal ring . . . . *coustani.*

Base of first hind tarsal segment entirely dark or at most with a few pale scales *coustani* var. *tenebrosus.*

5. Fifth hind tarsal segment white. . . . . 6.

Fifth hind tarsal segment dark or at most very narrowly pale at base . . . 8.

6. Abdominal segments largely or wholly devoid of scales (fourth and fifth hind tarsal segments wholly white) . . . . . *pretoriensis.*

Abdominal segments with numerous scales which form projecting tufts at the distal corners . . . . . 7.

7. Distal part of second hind tarsal segment and the whole of the third to the fifth white; front femora mainly pale with some dark speckling; mid and hind femora with a longitudinal white line terminating in an oval spot; tibiae mainly pale *pulcherrimus.*

Only the fifth hind tarsal segment entirely white, the other segments with broad white apical bands; femora and tibiae with irregular bands and spots . *pharoensis.*

8. Legs speckled or tibiae with an anterior pale line and mid femora with a pale band or double spot on dorsal aspect towards apex . . . . . 9.

Legs not so marked . . . . . 11.

9. Legs speckled . . . . . 10.

Legs with tibiae striped anteriorly and mid femora with subapical pale spots; (propleural bristles present; preapical dark area on vein 1 uninterrupted) *subpictus.*

10. Scales present on all abdominal tergites except the first; propleural bristles absent; preapical dark area on vein 1 uninterrupted . . . . . *stephensi.*

Scales present only on abdominal tergites VII and VIII; 1–2 propleural bristles present; preapical dark area of vein 1 usually with pale interruption. . *gambiae.*

11. Wings with pale spots confined to the costal region or at most with a few additional pale scales in the neighbourhood of the cross-veins; upright forked scales of head narrow, rodlike . . . . . *dthali.*

Wings with pale spots on all or most of the veins; upright forked scales of the usual type . . . . . 12.

12. All or most of the scutum covered with narrow scales, those on the fossae somewhat broader than the rest; base of costa pale scaled . . . . . *multicolor.*

Scutal fossae bare of scales (hairs often present); base of costa dark . . . 13.

13. Palps dark at tip or apical pale band interrupted giving a four-banded appearance . 14.

Palps three-banded, pale at tip* . . . . . 17.

14. Palps dark at tip . . . . . 15.

Palps pale at tip . . . . . 16.

* So far as is known the type form of *An. demeilloni* (which is the form believed to occur in Arabia) has the female palp invariably three-banded. A four-banded form (var. *carteri* De Meillon & Evans) occurs in South Africa, however, and if this were encountered in Arabia it would be liable to confusion with *An. cinereus*. It differs from the latter in having only one propleural bristle.

15. Dark markings of wing field relatively pale and inconspicuous ; hind tarsi dark *turkhudi*.
Wing markings darker and much more conspicuous (the difference is well seen with the naked eye) ; first three hind tarsal segments often with distinct apical pale spots *cinereus* (in part).

16. Four or more propleural bristles present ; a well marked pre-accessory sector spot present on vein 1 ; first three hind tarsal segments often with distinct apical pale spots . . . . . *cinereus* (in part).
Propleural bristles absent ; sector pale area uninterrupted ; hind tarsal segments at most very faintly pale at tips. . . . . *superpictus* (in part).

17. Propleural bristles absent ; subapical segment of palp about two-thirds the length of the preceding segment or more ; (third vein largely pale ; sector pale area uninterrupted ; scutal scales usually exceptionally broad and numerous) *superpictus* (in part).
At least one propleural bristle present ; subapical segment of palp usually not more than about three-fifths the length of the preceding segment, often less. . . 18.

18. That part of vein 1 proximal to the presector dark spot with a well-marked dark area . . . . . 19.
That part of vein 1 proximal to the presector dark spot wholly pale on upper surface of wing . . . . . 20.

19. Filaments of cones of female pharynx with spicular branches . . *culicifacies*.
These filaments smooth . . . . . *culicifacies* ssp. *adenensis*.

20. Wing with third vein largely or wholly dark . . . . . *sergenti*.
Wing with third vein largely pale . . . . . 21.

21. Vein 1 with well-marked pre-accessory sector spot. . . . . *demeilloni*.
Pre-accessory sector spot absent or rudimentary . . . . . *fluviatilis*.

Genus *Aëdes*

1. Scutum with a continuous border of white scales and a narrow median white line extending the whole length and forking in front of the scutellum ; middle tibia with an anterior white line from base to tip ; proboscis with a white line above from base nearly to tip . . . . . *granti*.
Markings otherwise . . . . . 2.

2. Clypeus scaly (though not always in the male) ; middle femur with an anterior white stripe from base almost to tip ; scutum with strongly marked lyre-shaped ornamentation (except in abnormally pale specimens in which the scutum may appear almost wholly whitish) . . . . . *aegypti*.
Clypeus bare (except in *Aë. vittatus*) ; ornamentation quite otherwise . . . 3.

3. Scutum with three pairs of small, round, snow-white spots ; femora each with a preapical white ring. . . . . *vittatus*.
Otherwise marked . . . . . 4.

4. Hind tarsi with pale rings embracing the joints ; fifth hind tarsal segment pale *caspius*.
Hind tarsi with pale rings confined to bases of segments ; fifth hind tarsal wholly or largely dark . . . . . 5.

5. Several lower mesepimeral bristles present ; abdominal tergites II–VI largely creamy, each with a pair of dark spots . . . . . *caballus*.
At most one lower mesepimeral bristle present, usually none ; tergites otherwise marked . . . . . 6.

6. Wing scales all dark (except sometimes at base of costa and first vein) ; tibiae dark or inconspicuously speckled . . . . . *arabiensis*.
Wings with at least some scattered pale scales ; tibiae heavily speckled . . 7.

7. Wing with relatively few pale scales which are mainly confined to the basal half *hirsutus* var. *adenensis*.
Whole wing with numerous scattered pale scales .. . . . . *natronius*.

Genus *Culex*

1. At least four lower mesepimeral bristles present; femora and tibiae each with an anterior row of well marked pale spots; tarsi dark; proboscis unringed (although some pale scales may be present in middle beneath) . . . . . *tigripes*.
   At most three lower mesepimeral bristles present (except sometimes in *C. duttoni*); markings otherwise . . . . . 2.
2. No lower mesepimeral bristle present; proboscis usually with a well developed pale ring in middle; tarsi with distinct pale rings at the joints . . . . . 3.
   1–3 lower mesepimeral bristles present; proboscis usually without a complete pale ring; tarsi dark (except in *C. duttoni*) . . . . . 5.
3. Wings with numerous scattered pale scales; abdominal tergites with apical pale bands of even width . . . . . *ethiopicus*.
   Wings with few or no pale scales (except sometimes on posterior margin of costa); abdominal tergites with pale bands basal . . . . . 4.
4. Fore and mid femora with numerous scattered pale scales on the anterior surface; upper fork cell of wing short, its base distal to that of the lower fork . *sitiens*.
   Fore and mid femora with few or no scattered pale scales; upper fork cell usually longer, its base at least slightly proximal to that of the lower fork cell . . *tritaeniorhynchus*.
5. Tarsi, especially of hind legs, with narrow pale rings; (usually with more than one lower mesepimeral bristle; middle tibia with white anterior stripe; hind tibia dark) *duttoni*.
   Tarsi dark . . . . . 6.
6. Abdominal tergites without complete basal pale bands (basi-lateral pale patches or apical pale bands or patches may be present) . . . . . 7.
   Abdominal tergites with complete basal pale bands . . . . . 11.
7. Abdominal tergites without apical pale markings. . . . . 8.
   Abdominal tergites with apical pale markings . . . . . 10.
8. Vertex with a band of broad whitish scales adjoining the eyes; integument of scutum and pleurae with a frosty grey appearance . . . . . *nebulosus*.
   All decumbent scales of vertex narrow; integument of scutum and pleurae brown . 9.
9. First hind tarsal segment approximately equal in length to the tibia; prealar scales present . . . . . *univittatus* var. *neavei*.
   This segment much shorter than the tibia; prealar scales absent . . *pusillus*.
10. Abdominal tergites with the apical pale bands broad and complete; postspiracular scales present . . . . . *arbieeni*.
    Abdominal tergites with apical pale bands narrow or incomplete (sometimes reduced to small apicolateral patches); postspiracular scales absent . . *salisburiensis*.
11. Postspiracular and prealar scales present . . . . . 12.
    Postspiracular scales always and prealar scales usually absent . . . . 15.
12. Hind tibia (and sometimes also the fore and mid femora and tibiae) with pale anterior stripe . . . . . 13.
    Femora and tibiae without pale anterior stripes (except sometimes on the mid leg in *C. simpsoni*) . . . . . 14.
13. Hind femur with anteroventral dark stripe on about the distal half; upper and lower scale patches on sternopleura confluent; basal bands on abdominal tergites produced posteriorly in the mid-line, at least on anterior segments . . *theileri*.
    Hind femur with only about the distal one-eighth of the anteroventral surface dark; upper and lower scale patches on sternopleura separate; abdominal tergites with basal pale bands or spots without posterior prolongation in the mid-line . . *univittatus*.
14. Sternites usually with dark apical bands; front coxae with some dark scales; (male palps normal) . . . . . *simpsoni*.

Sternites often without dark apical bands ; scales of front coxae sometimes all pale ; (male palps shorter than usual and nearly bare) . . . . . *sinaiticus.*

15. Sternites with dark apical bands ; (scutal scales with pronounced reddish tint ; proboscis dark beneath) . . . . . *decens.*

Sternites without dark apical bands . . . . . 16.

16. Two to four lower mesepimeral bristles normally present ; proboscis dark beneath . *laticinctus.*

Only one lower mesepimeral bristle normally present ; proboscis partly pale beneath 17.

17. Wing length about 6 mm.; (only a few hairs present on apical segments of male palps) . . . . . *mattinglyi.*

Wing length about 4 mm.; (male palps hairy as usual). . . . . 18.

18. Scutal scales reddish brown ; (upper fork cell, in female, more than three times as long as its stem ; male palps exceeding the proboscis by the length of the apical segment and about half the length of the subapical) . . . . . *pipiens.*

Scutal scales more buff tinted or scutal integument paler ; (male palps exceeding the proboscis by at most the length of the apical segment) . . . . . 19.

19. Upper fork cell of wing at least three times the length of its stem *pipiens* var. *molestus.*

Upper fork cell at most about two and a half times the length of its stem *pipiens* ssp. *fatigans.*

KEYS TO FOURTH STAGE LARVAE

Key to Genera

1. Siphon absent . . . . . *Anopheles.*

Siphon present . . . . . 2.

2. Siphon with numerous subventral tufts . . . . . *Culex.*

Siphon with only one subventral tuft . . . . . 3.

3. Subventral tuft of siphon arising near base . . . . . *Culiseta.*

Subventral tuft arising at about half way between base and apex of siphon or beyond . . . . . *Aëdes*

Genus *Anopheles*

1. Inner clypeal hairs with bases nearly touching . . . . . 2.

Inner clypeal hairs with bases widely separated . . . . . 3.

2. Pecten with 9–14 long teeth, usually at least 10 ; inner shoulder hair (hair 1 of prothorax) often branched from near base . . *coustani, coustani* var. *tenebrosus.*

Pecten with 6–9 long teeth ; inner shoulder hair usually simple or branched at tip only . . . . . *hyrcanus.*

3. Outer clypeal hairs branched . . . . . 4.

Outer clypeal hairs simple or at most frayed or split at tip . . . . . 5.

4. Outer clypeal hairs with 4–12 branches ; inner clypeal hairs distinctly frayed with several delicate branches on the distal two-thirds ; one long mesopleural bristle simple . . . . . *pulcherrimus.*

Outer clypeal hairs with about 20–45 branches ; inner clypeal hairs lightly feathered beyond middle ; both long mesopleurals simple . . . . . *pharoensis.*

5. Main tergal plates on abdominal segments III–VII very large, their posterior borders enclosing the anterior accessory tergal plate ; width of main plate on segment V at least three-quarters of the distance between the palmate hairs ; (metathoracic palmate hair exceptionally well developed) . . . . *fluviatilis.*

Anterior accessory tergal plates always entirely free ; width of main tergal plate on segment V not more than two-thirds of the distance between the palmate hairs (except sometimes in *An. sergenti* and *An. culicifacies adenensis*) . . . 6.

6. Both long mesopleural bristles feathered ; mouthbrushes projecting at right angles to the long axis of the fronto-clypeus . . . . . 7.

At least one mesopleural bristle simple (except as an occasional aberration in *An. multicolor*) ; mouthbrushes, when fully expanded, projecting obliquely . . 8.

7. Leaflets of abdominal palmate hairs with well marked shoulders on segments III–VII ; filaments of leaflets sharply pointed and about half length of blades . . *cinereus*.
Well developed palmate hairs on segments IV–VII only ; filaments of leaflets extremely short and blunt . . . . . *turkhudi*.

8. Both long metathoracic pleural hairs feathered . . . . . 9.
One long metathoracic pleural hair simple . . . . . 13.

9. Both long mesothoracic pleural bristles usually simple (the dorsal one sometimes split at about its middle into 2–4 branches) ; (bases of frontal hairs not surrounded by discrete dark spots ; inner anterior clypeal hairs devoid of fraying). . *subpictus*.
One long mesopleural bristle feathered . . . . . 10.

10. Seta 1 of metathorax differentiated to form a palmate hair ; inner anterior clypeal hairs with delicate fraying ; (no pigmentation round bases of frontal hairs) *superpictus*.
Seta 1 of metathorax undifferentiated ; inner anterior clypeal hairs without fraying (except sometimes in *An. stephensi*. A single barbule sometimes present in *An. pretoriensis*) . . . . . 11.

11. Inner shoulder hair (prothoracic hair 1) with basal tubercle absent or very poorly developed ; (well marked dark spots round bases of frontal hairs which may be fused to form a continuous band) . . . . . *multicolor*.
Inner shoulder hair with well developed chitinized tubercle . . . . . 12.

12. Palmate hair of segment II of abdomen small but with shoulders of leaflets well developed ; basal tubercles of inner and middle shoulder hairs (prothoracic hairs 1 and 2) often fused ; metathorax sometimes with a pair of small submedian tergal plates ; inner anterior clypeal hairs simple or at most with a single small barbule *pretoriensis*.
Palmate hair of segment II poorly developed ; basal tubercles of shoulder hairs separate ; metathorax without tergal plates ; inner anterior clypeal hairs often frayed . . . . . *stephensi*.

13. Both long mesopleural bristles simple (one occasionally feathered on one side of the thorax as an aberration in *An. dthali*) . . . . . 14.
One long mesopleural bristle feathered . . . . . 17.

14. Inner shoulder hair (prothoracic hair 1) without chitinized basal tubercle ; posterior accessory tergal plates absent ; inner anterior clypeal hairs often frayed . *gambiae*.
Inner shoulder hairs with chitinized basal tubercles ; paired posterior accessory tergal plates present on posterior abdominal segments ; inner anterior clypeal hairs always simple . . . . . 15.

15. Both pairs of caudal hairs with branches strongly hooked ; posterior clypeal hairs approximately equal in length to the outer anterior clypeals . . . *dthali*.
Branches of inner (upper) caudal hairs straight, their ends not recurved ; posterior clypeal hairs distinctly shorter than the outer clypeals . . . . . 16.

16. Fronto-clypeus with a characteristic dark Y-shaped marking, the paired arms of which extend forward well beyond the frontal hairs *culicifacies* ssp. *adenensis* (in part).
Clypeus otherwise marked . . . . . *culicifacies*.

17. Inner (upper) caudal hairs with branches straight, their ends not recurved ; paired posterior accessory tergal plates always present on posterior abdominal segments *culicifacies*. ssp. *adenensis* (atypical).
Inner caudal hairs with at least some branches hooked ; paired posterior accessory tergal plates absent (except in *An. dthali* and sometimes in *An. sergenti*) . . 18.

18. Paired posterior accessory tergal plates present on posterior abdominal segments *sergenti* (in part).
These plates entirely absent . . . . . 19.

19. Integument of fronto-clypeus frequently with a well marked dark band immediately posterior to the frontal hairs; base of antenna with spicules subequal; inner anterior clypeal hairs simple . . . . . 20.
Integument of fronto-clypeus often appearing almost unicolorous, at most with faintly marked spots which do not form a continuous band behind the frontal hairs; base of antenna with some spicules conspicuously longer than the others and these tending to form a distinct group; inner anterior clypeal hairs often lightly frayed *rhodesiensis* ssp. *rupicolus*.

20. Tubercle at base of inner shoulder hair (hair 1 of prothorax) variable in size, usually small, sometimes absent; width of main tergal plate on segment V of abdomen at least two-thirds of the distance between the palmate hairs, often more *sergenti* (in part).
Tubercle at base of inner shoulder hair large and strongly chitinized; main tergal plates smaller, the width of that on segment V not more than five-eighths of the distance between the palmate hairs . . . . . *demeilloni*.

Genus *Aëdes*

1. Antenna smooth; antennal seta minute, single; ventral brush without precratal tufts proximal to the main barred area . . . . . 2.
Antenna usually spiculate (the spicules often few and small, and perhaps sometimes absent altogether, in *Aë. vittatus* and *Aë. natronius*); antennal seta usually branched (sometimes single in *Aë. vittatus*); ventral brush with two or more tufts proximal to the barred area . . . . . 3.

2. Submedian denticles of typical comb spines strongly developed giving these spines a trifid appearance under low powers of the microscope . . . . . *aegypti*.
Submedian denticles of typical comb spines very small, only an occasional aberrant spine appearing trifid . . . . . *granti*.

3. Head hairs 5 and 6 (inner and mid frontal hairs, hairs C and B, respectively, of Hopkins, 1952) single or double, about equal in length . . . . . 4.
Either one at least of these hairs (usually both) with three or more branches or hair 6 much longer (and usually stouter) than 5 . . . . . 7.

4. Comb of 25–30 spines with median denticles not, or only slightly, more conspicuous than the lateral ones . . . . . *caspius*.
Comb of at most 12 spines, typical spines with stout median denticle and basal fringe (the median denticle sometimes reduplicated and the submedian denticles sometimes hypertrophied in aberrant spines) . . . . . 5.

5. Pecten with none of the spines more widely spaced than the others . . . *caballus*.
Pecten with at least one of the distal spines more widely spaced . . . . 6.

6. Antenna very sparsely spiculate (if at all); head seta 5 simple; pecten with only one tooth more widely spaced and this lying beyond the subventral siphonal tuft *vittatus*.
Antenna more strongly spiculate; head seta 5 plumose; pecten with 1–3 of the distal teeth more widely spaced and these all lying proximal to the subventral tuft *arabiensis*.

7. Antenna very sparsely spiculate (if at all); pecten teeth drawn out at their tips into long, slender, transparent filaments; head seta 6 with at least two branches, often more, not or only slightly longer than 5 . . . . . *natronius*.
Antenna more strongly spiculate; pecten teeth of more normal type; head seta 6 normally single, rarely double, much longer and usually stouter than 5 *hirsutus* var. *adenensis*.

Genus *Culex*

1. Setae of mouth-brushes modified to form strong curved spines; pecten teeth extending to apex of siphon . . . . . *tigripes*.
Setae of mouth-brushes unmodified; pecten not extending to apex of siphon . 2.

2. Siphon with about 20 subdorsal setae on distal two-thirds; (thorax and abdomen strongly spiculate) . . . . . *arbieeni*.
Siphon with at most about 8 subdorsal setae, usually less . . . . . 3.
3. Siphon very strongly swollen, biconvex, with long single subventral setae and a more or less well marked dark band near the apex . . . . . *duttoni*.
Siphon otherwise . . . . . 4.
4. Comb composed wholly or partly of spines . . . . . 5.
Comb composed entirely of scales (though these may look like spines in lateral view) 8.
5. Mentum a straight-sided triangle edged with numerous very minute teeth; comb with at most nine teeth; pecten confined to extreme base of siphon . . *ethiopicus*.
Mentum less regular in shape with large teeth; comb with at least about fourteen teeth; pecten more extensive . . . . . 6.
6. Comb composed of spines only; more distal pecten teeth very large and strongly curved . . . . . *theileri*.
Comb usually composed partly of scales; distal pecten teeth not strongly modified. 7.
7. Pecten extending for one-third the length of the siphon or less . . . *simpsoni*.
Pecten longer than this . . . . . *sinaiticus*.
8. Head setae 5 and 6 single; siphon strongly flared at tip . . . *salisburiensis*.
Head setae 5 and 6 with at least two branches; siphon not or only very slightly flared at tip . . . . . 9.
9. Head and siphon blackish; antenna less than half length of head; siphonal index 3 or less; anal papillae about three times the length of the saddle . . *nebulosus*.
Head and siphon at most dark brown; antenna at least half the length of the head; siphonal index usually greater; anal papillae usually shorter than this . . 10.
10. Pre-clypeal spines short, dark and extremely thick; anal papillae very small and rounded, about half the length of the saddle or less; (siphonal index not more than 6, usually less) . . . . . *sitiens*.
Without this combination of characters . . . . . 11.
11. Siphonal index 6 or more . . . . . 12.
Siphonal index less than 6 . . . . . 16.
12. Pre-clypeal spines long, hairlike; siphonal index at most 6·5 . . *pipiens* (in part).
Pre-clypeal spines shorter, spinelike or siphonal index more than 7·5, usually both . 13.
13. Pre-clypeal spines stout, blackish; subventral tufts of siphon at least slightly longer than the diameter of the siphon at point of attachment . . . *tritaeniorhynchus*.
Pre-clypeal spines more slender, usually paler; subventral tufts at most equal in length to the diameter of the siphon at point of attachment . . . . 14.
14. Denticles of more distal pecten teeth numerous, very regular in size and arising along the whole ventral side of the tooth . . . . . sp. indet.
Denticles of more distal pecten teeth less numerous (at most 5), irregular in size and position and not arising along the whole length of the tooth . . . . 15.
15. Siphonal index 8–11; ventral pair of anal papillae markedly shorter than the dorsal pair; lateral hair of abdominal segments III and V very long and single . *decens*.
Siphonal index 6–7·5; ventral pair of anal papillae not much shorter than the dorsal pair; lateral hair of segments III and V with at least two branches . . *univittatus*.
16. Inner (upper) caudal seta with at least four branches; ventral brush with 13–15 tufts (usually 14); mentum with 7–8 teeth on either side of the main central tooth; preclypeal spines spinelike . . . . . *laticinctus*.
Inner caudal seta with at most three branches; ventral brush with 12–13 tufts (usually 12); mentum with 7–13 lateral teeth; preclypeal spines hairlike . . 17.
17. Subventral tufts arising very close to the mid line, the most distal very near the apex; antenna strongly pigmented at base and beyond antennal tuft, pale in between; mentum with 7–8 teeth on either side of the central tooth. . . . *pusillus*.

Subventral tufts more lateral in position ; antenna more or less unicolorous or contrast between light and dark areas relatively slight ; mentum with lateral teeth usually more numerous . . . . . 18.

18. Siphon with 11–16 subventral tufts ; pecten with 14–19 teeth ; thoracic integument distinctly spiculated ; several of the subventral siphonal tufts inserted basad of the distal end of the pecten . . . . . *mattinglyi*.

Siphon with 6–10 subventral tufts ; pecten with 8–19 teeth ; thoracic integument without distinct spiculation ; at most one pair of subventral tufts inserted basad of the distal pecten tooth . . . . . 19.

19. Siphonal index usually more than 5 ; (subdorsal seta (hair 1) of abdominal segment III(and to a less extent IV) usually double*) . . . . . *pipiens* (in part).

Siphonal index never more than 4·8, usually less . . . . . 20.

20. Hair 1 of abdominal segments III and IV usually double* . . *pipiens* var. *molestus*.

This hair usually single* . . . . . *pipiens* ssp. *fatigans*.

DISTRIBUTION RECORDS

In many cases the following records were published without citing the date of collection. Wherever possible the dates in question have been ascertained from the data labels of preserved specimens and are here included. The boundaries of the various political divisions of the Arabian peninsula are shown in Text-fig. 2 The abbreviations B.M., L.S.H. and U.S.N.M. refer to the British Museum, the London School of Hygiene and the United States National Museum respectively.

Anopheles coustani s. str. W. SAUDI ARABIA. Jadaliya, 25.xi.1936, H. St.J. B. Philby (B.M.).

Anopheles coustani var. *tenebrosus*. E. SAUDI ARABIA. Katif and El-Khobar area, C. M. Hopkins (as *An. coustani* s.l., Leeson, 1948 : 254), near Hoffuf 4.ii.1944, C. M Hopkins (as *An. hyrcanus*, Leeson, 1948 : 254), Ain Rohem, 14.iii.1944, C. M. Hopkins (L.S.H.), El-Ajam, R. H. Daggy (Leeson, 1948 : 254), Ras Tanura, 29.iii. 1948, El-Ajam, 7.i–25.ii.1948, R. H. Daggy (U.S.N.M.). OMAN. Jurbaib, 29.x. 1930, B. S. Thomas (as *An. mauritianus* de Gr. & de Ch., Edwards *in* Thomas, 1931 : 235, as *An. coustani* var. *tenebrosus*, Evans, 1938 : 73).

Anopheles cinereus. YEMEN. El-Amra, 9.i.1951, El-Hauban (Wadi el-Malah), 6.i.1951, Birket Ghail Masnah, 5.ii.1951, Wadi Mal el-Ghail, 7.ii.1951, San'a, 12.ii.1951, K. L. Knight (Knight, 1953*b* : 219), San'a, viii.1945, L. Merucci (L.S.H.). W. ADEN PROT. Hardeba, xii.1904, i.1905, Sulek, i.1905, Jebel Jehaf, D'thala, W. S. Patton (as *An. jehafi* sp. n., Patton, 1905 : 632, as *An. cinereus*, Edwards, 1912 : 249), Mikhuras, x.1954 (B.M.). W. SAUDI ARABIA. Abah, 19 and 22.1944, A. R. Waterston (B.M.).

Anopheles culicifacies. BAHREIN. Manama, Arad (Afridi & Majid, 1938 : 469). TRUCIAL OMAN. Most parts, C. M. Hopkins (Leeson, 1948 : 254), Dmeith, 29.iii.1944 El-Kelba, 30.iii.1944, C. M. Hopkins (L.S.H.). OMAN. Wadi Bait al-Falaj, xi.1914–iii.1915 and x–xii.1915, Muscat, Darsait, Sidab, x–xii.1915, C. A. Gill (Gill, 1916 : 208).

Anopheles culicifacies ssp. *adenensis*. YEMEN. Hodeida, ii, iv and v.1944 and vi.1945, L. Merucci (as *An. culicifacies* var. *adenensis*, Buxton, 1944 : 211, Merucci,

* This is a statistical character involving the examination of at least 10 specimens of any one form. Hybrids are intermediate. (See Knight (1953*c*), who, however, erroneously described the subdorsal seta as hair 4).

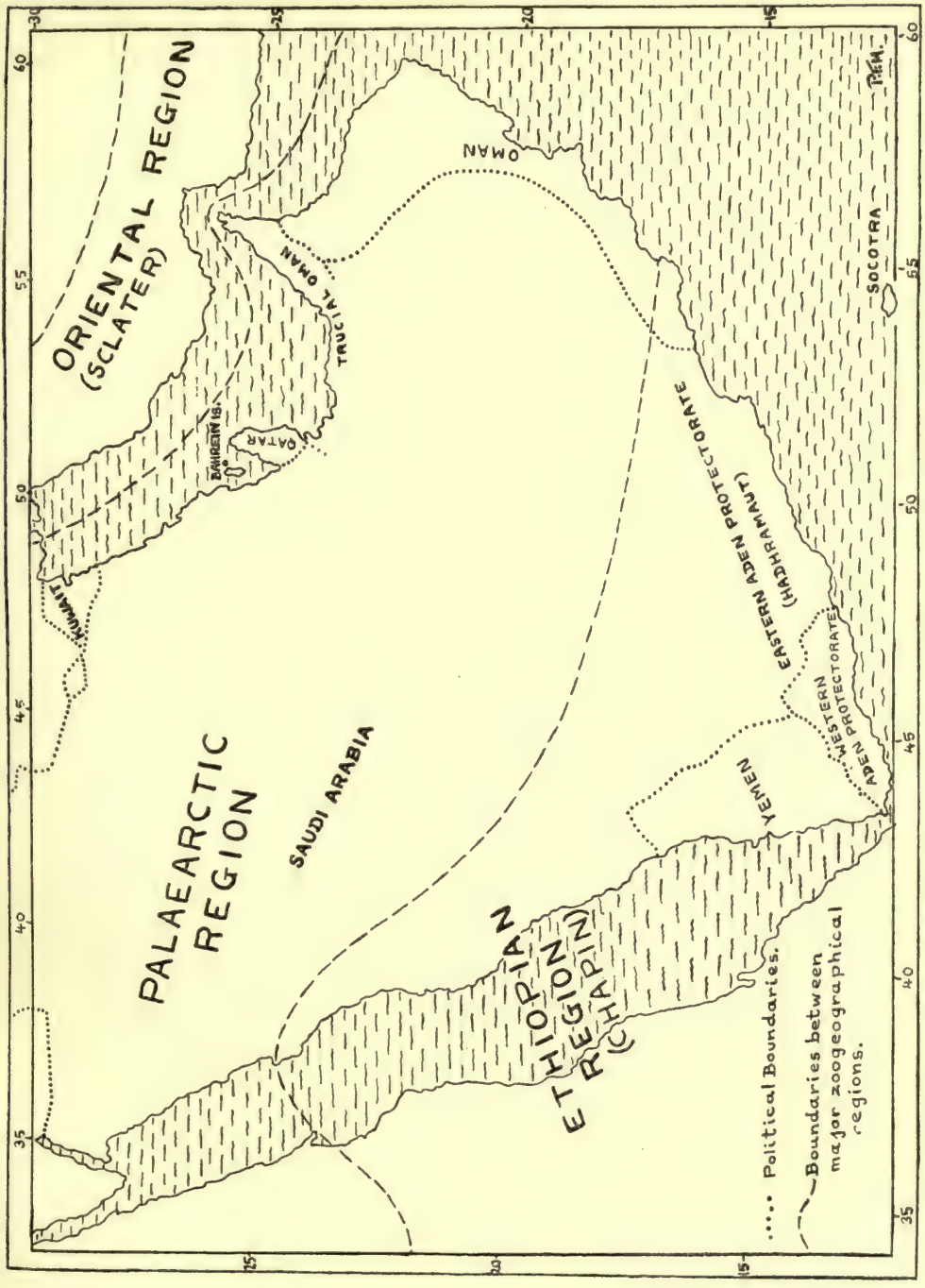

FIG. 4.—Political divisions of the Arabian peninsula. The boundary between the Ethiopian and palaearctic regions is taken from Chapin (1932 : 90).

1954 : 211, as *An. adenensis*, De Meillon, 1947 : 100), 28, 29 and 31.i.1951, K. L. Knight (as *An. adenensis*, Knight, 1953*b* : 219). W. ADEN PROT. Aden (as *An. culicifacies*, Phipson, 1934 : 46), Hinterland, K. Chand (as *An. culicifacies*, Christophers & Chand, 1915 : 186), Sheikh Othman, Dar al-'Amir, Al-Anad, Lahej (as *An. culicifacies* var. *adenensis*, Christophers, 1924 : 296). SOCOTRA. Hadibo, 7–8.xii. 1942, 11.i.1943, Kathub, Wadi Tintern, Nee, G. F. W. Hart (as *An. culicifacies* var. *adenensis*, Leeson & Theodor, 1948 : 225), Hadibo, ii.1954, N. L. Corkill (B.M.), Khor Hadjun, 12.xii.1942, G. F. W. Hart (L.S.H.), Unnamed localities, G. F. W. Hart (De Meillon, 1947 : 101). TRUCIAL OMAN. El-Kelba, 30.iii.1944, C. M. Hopkins (Leeson, 1948 : 254).

Anopheles demeilloni. YEMEN. Wadi Grab (near Ma'bar), 6.ii.1951, K. L. Knight (as *An. fluviatilis*, Knight, 1953*b* : 220). W. ADEN PROT. Mikhuras, x.1954 (B.M.).

Anopheles dthali. YEMEN. Wadi Raidan, 25.i.1951, Wadi Siham (near 'Obal, 4.ii.1951, K. L. Knight (Knight, 1953*b* : 220), Wadi So'lu (near Ta'izz), vi.1945, Wadi Rishan, (near Ta'izz), xii.1946, C. Toffolon (Buxton, 1944 : 211). W. ADEN PROT. Hardeba, x.1904–iv.1905, Sulek, i.1905, D'thala, Nobat Dakim, W. S. Patton (Patton, 1905 : 627), Wadi Tiban (as *An. rhodesiensis*, Christophers & Chand, 1915 : 182, as *An. dthali*, Christophers & Puri, 1931*b* : 1134). Wadi Ma'adin, 2 and 11.ii.1940, Huweimi, Qoreina and Kirsh (Wadi Natd), Tor um Baha, P. W. R. Petrie (Petrie & Seal, 1943 : 42–81). W. SAUDI ARABIA. Jedda, 22.i.1946, N. L. Corkill (B.M.). E. ADEN PROT. Mukalla, ii and iii.1952, Jizwal, 27.iv.1953, Meifa 28.iv.1953, Mehmida, 26.iv.1953, Sidara, 22.iv.1953, Harshiyat, iii.1953, 27.iv. 1953, Khirba, iii.1953, Wasita, Geregeri, 25.v.1953, Urfat Subai, Sukhal al-Dis, 24.v.1953, N. L. Corkill (B.M.). SOCOTRA. Everywhere (as *An. dthali* var. *wardi* var. nov., Leeson & Theodor, 1948 : 222), Hadibo, 8.xii.1942, Kallansiya, 5.i.1943, Kathub, 5–6.xii.1942, Khor Hadjun, 7.xii.1942, Wadi Killiem, 17.i.1943, G. F. W. Hart (B.M.), Kathub, 28.xii.1942, Kallansiya, 6.i.1943, Hayoo, 7.i.1943, Devil's Creek, 7.xii.1942, A'aith, 14.i.1943, Mouri, 21.xii.1942, Beyond Goor, 15.i.1953, G. F. W. Hart (L.S.H.), Hadibo, ii.1954, N. L. Corkill (B.M.). OMAN. Wadi Bait al-Falaj, iii–vi.1915 and x–xii.1915, C. A. Gill (as *An. rhodesiensis*, Gill, 1916 : 209).

Anopheles fluviatilis. E. SAUDI ARABIA. Near Katif, El-Khobar, i.1944, Hoffuf, C. M. Hopkins (Leeson, 1948 : 254), Saihat, i.1947–ii.1948, R. H. Daggy (Leeson, 1948 : 254), Hoffuf, 6.ii.1944, Safwa, 14.iii.1944, C. M. Hopkins (L.S.H.), Saihat, 10.xi.1947, R. H. Daggy (U.S.N.M.). BAHREIN. Manama (Afridi & Majid, 1938 : 469). OMAN. Wadi Bait al-Falaj, xi.1914–vii.1915 and x–xii.1915 (as *An. funestus* var. *arabica*, Gill, 1916 : 209, Christophers & Chand, 1915 : 189, as *An. arabicus*, Christophers & Puri, 1931*a* : 486).

Anopheles gambiae. YEMEN. El-Amra, 9.i.1951, Ta'izz, 12.i.1951, Wadi Raidan, 25.i.1951, K. L. Knight (Knight, 1953*b* : 220), Ta'izz, C. Toffolon, 1943–1945 (Buxton, 1944 : 212, Merucci, 1954 : 211), Madinat el-Abid, 1946, Wadi Worazan 1945, C. Toffolon, ((Merucci, 1954 : 211). W. ADEN PROT. Aden (as *An. subpictus*, Phipson, 1934 : 46), Wadi Tiban, K. Chand (as *An. costalis* Theobald, Christophers & Chand, 1915 : 192), Sheik Othman, ii.1904, i.1905, Bir Said Ali, ii.1905, Nobat Dakim, iii–xi.1904, Ulub, v.1904, Hardeba, iii.xi.1904, D'thala, v–x.1904, Lahej,

Salim, Sulek, Am Riga, W. S. Patton, Steamer Point. Young (as *An. arabiensis* sp. n., Patton, 1905 : 626), Shuqra, 18.xii.1939, Haski, 31.xii.1939 and 4.i.1940, Wadi Ma'adin, 4.ii.1940, Kod, Abyan, Lahej, El-Waht, Huweimi, Qoreina and Kirsh (Wadi Natid), Tor um Baha, Wadi Hidaba, Museimir, P. W. R. Petrie (Petrie & Seal, 1943 : 13–149), Mikhuras, x.1954 (B.M.). W. Saudi Arabia. Jedda, xii.1936–i.1937, F. P. Mackie, Wadi Liya, 22.i.1937, H. St. J. B. Philby (Buxton, 1944 : 212). E. Aden Prot. Al-Hadba, iii.1952, Harshiyat, iii.1953 and 27.iv. 1953, Jizwal, 27.iv.1953, Hauta (Hajr), 24.iv.1953, Jol Bahawa, 18.iv.1953, Meifa, 28.iv.1953, Sidara, 22.iv.1953, Rukub, iii.1953, Al–Ais, iii.1953, Khirba, iii.1953, Amd Town, i.1954, N. L. Corkill (B.M.).

Anopheles multicolor. W. Saudi Arabia. Jedda, 1936, F. P. Mackie (Buxton, 1944 : 212), 22.i.1946, N. L. Corkill (B.M.). E. Saudi Arabia. El-Kharj, 16–22.ii. 1944, Hoffuf, 6.ii and 6.iii.1944, Katif, El-Khobar, Suleimiya, C. M. Hopkins (Leeson, 1948 : 254), El-Kharj, 30.xii.1947, 7.ii.1948, R. H. Daggy (L.S.H.), 28.i.1948, R. H. Daggy (U.S.N.M.). Trucial Oman. Ras el-Kham'ar, 24.iii.1944, El-Kelba, 30.iii.1944, C. M. Hopkins (L.S.H.).

Anopheles pharoensis. Yemen. El-Hauban (Wadi el-Malah), 16 and 19.i.1951, K. L. Knight (Knight, 1953*b* : 221). W. Saudi Arabia, Jebel el-Scharr (Martini & Hlisnikowski, 1942.*

Anopheles pretoriensis. Yemen. Wadi Raidan, 25.i.1951, Wadi Siham (near 'Obal), 4.ii.1951, K. L. Knight (Knight, 1953*b* : 221), Wadi So'lu, vi.1945, C. Toffolon (L.S.H.), Wadi Worazan, 1945, C. Toffolon (Merucci, 1954 : 211). W. Aden Prot. Hinterland as far up as Jehaf (6,800 ft.), W. S. Patton (as *An. tibani* sp. n., Patton, 1905 : 630, as *An. pretoriensis*, Christophers & Chand, 1915 : 195, as ? *An. theobaldi*, Buxton, 1944 : 212), Wadi Ma'adin, 4.ii.1940, P. W. R. Petrie (Buxton, 1944 : 212), Tor um Baha, P. W. R. Petrie (Petrie & Seal, 1943 : 80).

Anopheles pulcherrimus. E. Saudi Arabia. Katif and El-Khobar area, C. M. Hopkins (Leeson, 1948 : 254), Hoffuf, 6.ii.1944, C. M. Hopkins (L.S.H.), El-Ajam, 12.i.1947 and 29.vii.1947, R. H. Daggy (L.S.H.), El-Ajam and Saihat and Dammam, 30.ix.1947–12.i.1948, R. H. Daggy (U.S.N.M.). Bahrein. Manama, 15–21.v. 1938, Rifa a-Ash Sharqi (Afridi & Majid, 1938 : 444, 469).

Anopheles rhodesiensis ssp. *rupicolus*. Yemen. Ta'izz, viii–ix.1943, C. Toffolon (as *An. dthali*, Buxton, 1944 : 211), 12.i.1951, K. L. Knight (Knight, 1953*b* : 223). W. Aden Prot. Huweimi and Kirsh (Wadi Natid), iii.1940, P. W. R. Petrie (as *An. rupicolus*, Petrie & Seal, 1943 : 63, 82, Buxton, 1944 : 213). E. Aden Prot. Quaidun (Wadi Duan), 5.ix.1952, L. Merucci (B.M.).

Anopheles sergenti. Yemen. El-Hauban (Wadi el-Malah), 16 and 17.i.1951, Wadi Siham (near 'Obal), 4.ii.1951, K. L. Knight (Knight, 1953*b* : 223, San'a, 1945, L. Merucci (Merucci, 1954 : 211). W. Aden Prot. Huweimi and Kirsh (Wadi Natid), iii.1940, P. W. R. Petrie (as ? *An. macmahoni* Evans, Petrie & Seal, 1943 : 63, 82, Buxton, 1944 : 213). W. Saudi Arabia. Jedda, x.1948, N. L. Corkill (B.M.),

* We are indebted for this record to Professor E. Martini, Dr. Jacques M. May of the American Geographical Society and Dr. Jusatz of the University of Heidelberg. The original source of the record cannot be traced, and as we have no indication of the altitude concerned we have ignored it in dealing with the altitudinal distribution of *An. pharoensis*.

Tarfaa (Wadi Fatima), xii.1953, Madaneya (near Medina), vi.1953, W.H.O. Team (L.S.H.). E. ADEN PROT. Shibam, xi.1951, E. Hoeck, Tarim, xi.1951, L. Merucci (B.M.). E. SAUDI ARABIA. Katif and El-Khobar area, C. M. Hopkins (Leeson, 1948 : 254), Safwa, 14.iii.1944, Anaiza, 23.iv.1944, C. M. Hopkins (L.S.H.), El-Khobar, iv. 1948, El-Ajam, i.1947, Dammam, x.1947, R. H Daggy (U.S.N.M.). BAHREIN. Manama 14.v–11.vi.1938 (Afridi & Majid, 1938 : 444).

Anopheles stephensi. E. SAUDI ARABIA. Hoffuf, 6.ii.1944, 6.iii.1944, Katif and El-Khobar area, C. M. Hopkins (Leeson, 1948 : 254), Safwa, 14.iii.1944, C. M. Hopkins (L.S.H.), El-Khobar, 17.iv.1948, Dammam, 30.ix.1947, El-Kharj, 30.xii.1947, 7.ii.1948, Saihat, 2.x.1947, R. H. Daggy (Leeson, 1948 : 254), El-Khobar, Dammam, Saihat, El-Kharj and El-Ajam, 3.x.1947–7.ii.1948, R. H. Daggy (U.S.N.M.). BAHREIN. Unnamed locality, i.1906, A. Bennett (as *Nyssorhynchus metaboles* Theobald, Giles, 1906 : 130), Sakhir, Basaitin (Afridi & Majid, 1938 : 439), Manama, 14.v–15.vi.1938. (Afridi & Majid, 1938 : 444), Galali, Diraz, Rifa a-Ash Sharqi, Muharrak, Khamis. (Afridi & Majid, 1938 : 469). TRUCIAL OMAN. El-Kelba, 30.iii.1944, C. M. Hopkins (Leeson, 1948 : 254). OMAN. Darsait, x–xii.1915, Muscat, xi–xii.1915, C. A. Gill (Gill, 1916 : 208).

Anopheles turkhudi. YEMEN. San'a, vi.1942, L. Merucci (Merucci, 1954 : 211), Aina, 5.xii.1936, H. St.J. B. Philby (B.M.) W. ADEN PROT. Azriki, W. S. Patton (as *An. azriki* sp. n., Patton, 1905 : 633, as *An. turkhudi*, Christophers & Chand, 1915 : 190). Hiswa (Buxton, 1944 : 212), Wadi Tiban, i.1951, K. L. Knight (Knight, 1953*b* : 223). W. SAUDI ARABIA. Madruga, 26.x.1936, F. P. Mackie (Buxton, 1944 : 212).

Culiseta longiareolata. YEMEN. Hamman 'Ali, 5.ii.1951, Wadi Dhahr, 11 and 13.1951, Rouda, 15.ii.1951, San'a, 12.ii.1951, K. L. Knight, 22–30.ix.1937, C. Rathjens, 26.viii.1946, A. R. Waterston (Knight, 1953*b* : 224). W. ADEN PROT. Mikhuras, x.1954 (B.M.), Awabil, iv.1954, N. L. Corkill (B.M.). W. SAUDI ARABIA. Buraiman, 22.i.1946, E. S. Brown (B.M.). E. SAUDI ARABIA. El-Kharj, 31.i.1948, R. H. Daggy (U.S.N.M.), 16–22.ii.1944, C. M. Hopkins (L.S.H.). TRUCIAL OMAN. Khars, 23.iii.1944, C. M. Hopkins (L.S.H.).

Aëdes caballus. E. ADEN PROT. Amd Town, i.1954, Sana (Wadi Rakhya), iv.1954, N. L. Corkill (B.M.).

Aëdes caspius. SOCOTRA. Ras Shoab, i.1899, O. Simony (as *Culex arabicus* sp. n., Becker, 1931 : 140). E. SAUDI ARABIA. El-Kharj, 31.i–4.ii.1948, Saihat, 28.ix.1947, Dammam, 9.ii.1948, R. H. Daggy (U.S.N.M.), Hoffuf, iii.1944, C. M. Hopkins (as *Aë. mariae* Sergent, Hopkins, MS.). BAHREIN. Unnamed locality, i.1906, A. Bennett (as *Mansonia arabica* sp. n., Giles, 1906 : 130).

Aëdes aegypti. YEMEN. Murawah, 30.i.1951, Hodeida, 1.ii.1951, K. L. Knight (Knight, 1953*b* : 224), Kameran I., D. Thompson. (Lewis, 1945 : 10). W. ADEN PROT. Aden, all the year round (as *Stegomyia fasciata* Fabricius, Smith & Loughnan, 1914 : 706, as *Aë. aegypti*, Petrie & Seal, 1943 : 83), Steamer Point, 11.ix.1911 and 10.x–1.xii.1912, A. Dawson (Edwards, 1941 : 130). W. SAUDI ARABIA. Mecca, B. es Sayed (Lewis, 1945 : 10), Jedda (Brunelli, 1936), 25.x.1936, F. P. Mackie, 6.xi.1949, N. L. Corkill (B.M.). E. ADEN PROT. Amd, ii.1952, N. L. Corkill, Tarim, v.1952, L. Merucci (Mattingly, 1953*a* : 60), Aiyad, 19.iv.1953, Rukub,

Harshiyat, Al-Ais, Fewa and Burum, iii.1953, N. L. Corkill (Mattingly, 1953*b* : 296), Al-Beidha, Dis Town, Geregeri, Hami, Wasita, 25.v.1953, Sukhal al-Dis, Urfat Subai, 24.v.1953, N. L. Corkill (Mattingly & Bruce-Chwatt, 1954 : 191), Mukalla and Rukub, iii.1952, Shihr, ii.1954, Shuabat Amudi (Wadi Amd), Hami al-Sharq, iv.1954, Rubat Bakhoban (Wadi Amd) and N'Air (Wadi Amd), i.1954, Mahfud (Wadi Irma) and Sahwa and Sana (both Wadi Rakhya), iv.1954, N. L. Corkill (B.M.). SOCOTRA. Ras Shoab, i.1899, O. Simony (Becker, 1931 : 140). BAHREIN. Unnamed locality, i.1906, A. Bennett (as *Stegomyia Fasciata* Fabricius, Giles, 1906 : 131, Edwards, 1941 : 130). TRUCIAL OMAN. Dubai, 19.iii.1944, C. M. Hopkins (L.S.H.). OMAN. Muscat, 1902, M. Biró (as *St. fasciata*, Theobald, 1905 : 73).

Note.—The pale form has been found in all the localities in the Eastern Aden Protectorate except Mukalla and Rukub. Knight (1953*b*) records a high proportion of pale forms among his Yemen specimens. Specimens in the British Museum from Jedda, Bahrein I. and Steamer Point, Aden, are also pale. The only specimens in the British Museum which can be assigned with any confidence to the dark form are a small number from Jedda and Mukalla.

Aëdes granti. SOCOTRA. Dahamis, 20.xii.1898, W. R. O. Grant (Theobald, 1901 : 306), Mouri, 10–16.xii.1942, G. F. W. Hart (Leeson & Theodor, 1948 : 226).

Aëdes vittatus. W. ADEN PROT. Aden, Nobat Dakim, Sheik Othman, Ulub, W. S. Patton (Patton, 1905 : 634), Jebel Jehaf (7,100 ft.), ix and x.1937, H. Scott and E. B. Britton, Aden Hinterland, 20.ii.1895,—. Yerbury (Edwards, 1941 : 155), Awabil, iv.1954, N. L. Corkill (B.M.). E. ADEN PROT. Wadiyain, 12.viii.1936, H. St.J. B. Philby (Edwards, 1941 : 155, Mattingly, 1952 : 256). SOCOTRA. Kallansiya, 4.i.1943, Hadibo, Kathub, G. F. W. Hart (Leeson & Theodor, 1948 : 227). Hadibo, ii.1954, N. L. Corkill (B.M.).

Aëdes arabiensis. W. ADEN PROT. Ulub, v.1904, Aden (in the crater), W. S. Patton (as *Culex arabiensis* sp. n., Patton, 1905 : 633, as *Aëdes vexans* Meigen, Edwards, 1921 : 323, as *Aë. arabiensis*, Edwards, 1941 : 195), Aden Hinterland, vi.1914, K. Chand (Edwards 1941 : 195). W. SAUDI ARABIA. Jedda, 1927, H. St.J. B. Philby (Edwards, 1941 : 195), Madruga, 26.x.1936, F. P. Mackie (B.M.).

Aëdes hirsutus var. *adenensis*. W. ADEN PROT. Jebel Jehaf (at about 7,100 ft.), ix.1937, H. Scott & E. B. Britton (Edwards, 1941 : 198), D'thala, ix.1937, H. Scott & E. B. Britton (B.M.).

Aëdes natronius. YEMEN. El-Hauban (Wadi el-Malah), 19.i.1951, Hamman 'Ali, 5.ii.1951, K. L. Knight, (Knight 1953*b* : 212).

Culex tigripes. YEMEN. Ta'izz, 12 and 18.i.1951, K. L. Knight, Usaifira, xii.1937, H. Scott and E. B. Britton (Knight, 1953*b* : 225). W. ADEN PROT. Jebel Jehaf (7,100 ft.), E. B. Britton (Edwards, 1941 : 249), D'thala, W. S. Patton (as *Culex concolor* Robineau Desvoidy, Patton, 1905 : 636). W. SAUDI ARABIA. Abah, 22.vii.1944, A. R. Waterston (B.M.).

Culex arbieeni. YEMEN. El-Hauban (Wadi el-Malah), 16.i.1951, Wadi Mal el-Ghail, 7.ii.1951, K. L. Knight (as *Culex jenkinsi* sp. n., Knight, 1953*a* : 324).

Culex salisburiensis. YEMEN. Wadi Grab (near Ma'abar), 6.ii.1951, K. L. Knight (Knight, 1953*b* : 226).

Culex sp. indet. YEMEN. El-Hauban (Wadi el-Malah), 19.i.1951, K. L. Knight (as ? *Culex jenkinsi* sp. n., Knight, 1953*b* : 225 (larva only)).

Culex nebulosus. YEMEN. Ta'izz, 17.i.1951, K. L. Knight (Knight, 1953*b* : 228).

Culex pusillus. E. SAUDI ARABIA. El-Ajam, 4.ix.1947, El-Kharj, 30.xii.1947, El-Khobar, 13.xii.1947, R. H. Daggy (U.S.N.M.), El-Kharj, 16–22.iii.1944, C. M. Hopkins (L.S.H.).

Culex decens. YEMEN. Ta'izz, 12 and 18.i.1951, K. L. Knight (Knight, 1953*b* : 229). W. ADEN PROT. Tor um Baha, P. W. R. Petrie (Petrie & Seal, 1943 : 80).

Culex duttoni. W. ADEN PROT. Mikhuras, x.1954 (B.M.).

Culex ethiopicus. YEMEN. Wadi Siham (near 'Obal), 4.ii.1951, K. L. Knight (Knight, 1953*b* : 229). W. ADEN PROT. D'thala, Hardeba, Nobat Dakim (as *Taeniorhynchus tenax* var. *maculipes arabiensis* var. nov., Patton, 1905 : 635), Wadi Ma'adin, 2–4.ii.1940, P. W. R. Petrie (Edwards, 1941 : 292), Tor um Baha, P. W. R. Petrie (Petrie & Seal, 1943 : 80).

Culex laticinctus. YEMEN. Ta'izz, 18.i.1951, K. L. Knight (Knight, 1953*b* : 229). W. ADEN PROT. Awabil and Khalla, iv.1954, N. L. Corkill (B.M.), Mikhuras, x.1954 (B.M.). W. SAUDI ARABIA. Shi Aera (near Qunfida), W.H.O. Malaria Team (L.S.H.), Buraiman, 22.i.1946, E. S. Brown (B.M.), Hima, 22.vi.1936, H. St.J. B. Philby (Edwards, 1941 : 314). E. ADEN PROT. N'air, Anag, Khirbat Bakarman, Amd Town, Nafhun, Shuabat Amudi (all Wadi Amd), Rubat Bakhoban, Hajrein (Wadi Duan), all i.1954, Geidun (Wadi Laiser) and Sana (Wadi Rakhya), iv.1954, N. L. Corkill (B.M.). SOCOTRA. Mouri, 13 and 20.xii.1942, Hadibo, 11 and 13.xii.1942, Kathub, 5 and 13.xii.1942, G. F. W. Hart (Leeson & Theodor, 1948 : 228), Kallansiya, 15.i.1943, G. F. W. Hart (L.S.H.). OMAN. Muscat, 1915, C. A. Gill (Edwards, 1921 : 342).

Culex mattinglyi. YEMEN. Birket Shiekh Kunnaf, 13.ii.1951, Wadi Dhahr, 11 and 13.ii.1951, Rouda, 15.ii.1951, San'a, 12.ii.1951, K. L. Knight (Knight, 1953*a* : 322), San'a, 29.i.1938, –.ii.1938, 9.ii.1938 and –.iii.1938, H. Scott and E. B. Britton (as *Culex laticinctus*, Edwards, 1941 : 314, as *Culex mattinglyi*, Knight, 1953*b* : 229). W. SAUDI ARABIA. Dhahran, 22.vi.1936, H. St.J. B. Philby (as *Culex laticinctus*, Edwards, 1941 : 314).

Culex pipiens. YEMEN. Ta'izz, 21.i.1951, Hammam 'Ali, 5.ii.1951, K. L. Knight, Hada, 14.i.1938, San'a, i and ii.1938, H. Scott and E. B. Britton (Knight, 1953*b* : 230). W. ADEN PROT. D'thala, Nobat Dakim, Hardeba, Jebel Jehaf above 7,000 ft., W. S. Patton (Patton, 1905 : 635), Am Riga, W. S. Patton (Patton, 1905 : 627), Mikhuras, x.1954 (B.M.). W. SAUDI ARABIA. Taif, 31.x.1936, F. P. Mackie (B.M.). E. ADEN PROT. Seiyun, ii.1952, N. L. Corkill (B.M.). E. SAUDI ARABIA. El-Kharj, i and ii.1948, R. H. Daggy (U.S.N.M.), El-Kharj, 16–22.ii.1944, C. M. Hopkins (L.S.H.), Hoffuf, ii.1944, C. M. Hopkins (Hopkins, MS.). TRUCIAL OMAN. Khars, 23.iii.1944, C. M. Hopkins (L.S.H.).

Culex pipiens ssp. *fatigans.* YEMEN. Murawah, 30.i.1951, K. L. Knight (as *Culex quinquefasciatus* Say, Knight, 1953*b* : 230). W. ADEN PROT. Practically everywhere including Jebel Jehaf (Patton, 1905 : 635), Lahej, x : 1935, R. C. M. Darling (B.M.), D'thala, W. S. Patton (Patton, 1905 : 636), Aden, all the year round (Smith & Loughnan, 1914 : 706), Shuqra, P. W. R. Petrie (Petrie & Seal, 1943 : 80),

Aden, 1913, W. F. M. Loughnan. (B.M.). W. SAUDI ARABIA. Jedda, 25.x.1936, F. P. Mackie, 21.ix.1948 and –.ix.1949, N. L. Corkill, Mecca, 16.x.1936 and 1.xi.1936. F. P. Mackie (B.M.). E. ADEN PROT. Wadi Duan, xi.1935, R. C M. Darling, Rubat Bakhoban and N'Air (Wadi Amd), i.1954, N. L. Corkill (B.M.). SOCOTRA. Hayoo, 7.i.1943, Kathub 5 and 6.xii.1942, Mouri, 16.xii.1942, Kallansiya, Hadibo (Leeson & Theodor, 1948 : 228), Hadibo, ii.1954, N. L. Corkill (B.M.). BAHREIN. Unnamed locality, i.1906, A. Bennett (Giles, 1906 : 131). TRUCIAL OMAN. El-Kelba, 30.iii.1944, C. M. Hopkins (L.S.H.). OMAN. Salalah, 1 29.xi. 1953, M. J. Gavin (U.S.N.M.).

Culex pipiens var. molestus. W. SAUDI ARABIA. Jedda, 25.x.1936, F. P. Mackie (B.M.).

Culex simpsoni. YEMEN. El-Hauban (Wadi el-Malah), 16.i.1951, K. L. Knight (Knight, 1953*b* : 230).

Culex sinaiticus. YEMEN. Wadi Raidan, 25.i.1951, Wadi Siham (near 'Obal), 4.ii.1951, K. L. Knight (Knight, 1953*b* : 231). W. ADEN PROT. Wadi Ma'adin, 2.ii.1940, P. W. R. Petrie (Edwards, 1941 : 311), Tor um Baha, P. W. R. Petrie (Petrie & Seal, 1943 : 80). E. ADEN PROT. Harshiyat, iii : 1953, N. L. Corkill (B.M.). SOCOTRA. Mouri, 13.i.1943 Kathub, 5 and 6.xii.1942, Hadibo (Leeson & Theodor, 1948 : 228), Hadibo, ii : 1954, N. L. Corkill (B.M.). E. SAUDI ARABIA. Saihat, 26.ix.1947, R. H. Daggy (U.S.N.M.). OMAN. Muscat, 1915, C. A. Gill (B.M.).

Culex sitiens. YEMEN. Hodeida, iii.1938, H. Scott and E. B. Britton, 28, 29 and 31.i and 4.ii.1951, K. L. Knight (Knight, 1953*b* : 231. W. ADEN PROT. Aden, 1913, W. F. M. Loughnan, Shuqra, P. W. R. Petrie (Petrie & Seal, 1943 : 80). W. SAUDI ARABIA. Jedda, 1936, F. P. Mackie, 1927, H. St.J. B. Philby (Edwards, 1941 : 298). E. ADEN PROT. Wadi Maseila, 8.xii.1934, H. Ingrams (Edwards, 1941 : 298), Harshiyat, Buaish, Al-Ais, Burum, Thilla, all iii.1953, Shihr, ii.1954, Khon (Wadi Maseila), vii.1953, Gheil Bawazir, Hami al-Sharq and Mukalla, all iv.1954, Wasita, Hami, Al-Beidha, Dis Town, Geregeri, 25.v.1953, Urfat Subhai, Sukhal al-Dis, 24.v.1953, N. L. Corkill (B.M.). SOCOTRA. Ras Shoab, i.1899, O. Simony (as *Culex annulus* Theobald, Becker, 1931 : 140), Mouri, 16.xii.1942, Khor Hadjun, 7–12.xii.1942, Kathub, 6.xii.1942, G. F. W. Hart (Leeson & Theodor, 1948 : 227). TRUCIAL OMAN. Abu Dhubi and Sharja, 21.iii.1944, El-Kelba, 30.iii.1944, C. M. Hopkins (L.S.H.). OMAN. Salalah, 19.xi.1953, M. J. Gavin (B.M.).

Culex theileri. YEMEN. El-Amra, 9.i.1951, El-Hauban (Wadi elMalah) 16 and 19.i.1951, Birket Ghail Masnah, 5.ii.1951, Birket Ma'agel Biet Myiad, 12.ii.1951, K. L. Knight, Hada, i.1938, H. Scott and E. B. Britton, San'a, x.1937, C. Rathjens, i.1938, H. Scott and E. B. Britton (Knight, 1953*b* : 232). W. ADEN PROT. Jebel Jehaf, 7,100 ft., ix.1937, H. Scott and E. B. Britton (Edwards, 1941 : 306), Mikhuras, x.1954 (B.M.).

Culex tritaeniorhynchus. YEMEN. Wadi Siham (near 'Obal), 4.ii.1951, K. L. Knight (Knight, 1953*b* : 232). E. ADEN PROT. Hauta (Hajr), 24.iv.1953, Dis Town, 25.v.1953, Urfat Subai, 24.v.1953, N.L. Corkill (B.M.). SOCOTRA. Kathub, 4–25.xii.1942, G. F. W. Hart (as *Culex thalassius* Theobald, Leeson & Theodor,

1948 : 228), Kallansiya, 5.i.1943, G. F. W. Hart (B.M.), Wadi Maurio, 17.i.1943, G. F. W. Hart (L.S.H.). E. SAUDI ARABIA. El-Ajam, ix.1947, El-Khobar, x and xii.1947, Saihat, 26.ix.1947, R. H. Daggy (U.S.N.M.). OMAN. Salalah, 26.xi.1953, M. J. Gavin (B.M.).

Culex univittatus. YEMEN. Usaifira (near Ta'izz), 13.xii.1937, H. Scott and E. B. Britton (as *C. univittatus* var. *neavei* Theobald, Knight, 1953*b* : 233). OMAN. Se'harr, 1.iv.1944, El-Kelba, 30.iii.1944, C. M. Hopkins (L.S.H.).

LIST OF LOCALITIES

Most of the localities in the Yemen were visited by one of us (K. L. K.). For details of localities in the Eastern Aden Protectorate we are indebted to Dr. N. L. Corkill. Details of a number of Philby's localities are given in Philby (1952), of Thomas's in Thomas (1931) and of Patton's in Patton (1905). Apart from this we have relied mainly on maps and on the admirable series of geographical handbooks prepared by the Naval Intelligence Division in London. In the case of wadis the latitude and longitude given are approximately those of the middle of their course. The altitudes given for Jebel el-Scharr and Jebel Jehaf are those of their summits.

Locality.	Approximate altitude (ft.).	Approximate latitude and longitude. N.	E.
A'aith, Socotra	—	Not Located.	
Abah (Abha), W. Saudi Arabia	8,000	18° 0′	42° 30′
Abu Dhubi, Trucial Oman	<500	24° 15′	54° 33′
Abyan, W. Aden Prot.	<500	13° 5′	45° 20′
Aden, W. Aden Prot.	<500	12° 45′	45° 4′
Aina, Yemen	4,500	17° 45′	43° 15′
Ain Rohem, E. Saudi Arabia	—	Not Located.	
Aiyad, E. Aden Prot.	3,000	15° 0′	46° 50′
Al-Ais, E. Aden Prot.	<500	Mukalla area.	
Al-Anad, W. Aden Prot.	<500	13° 15′	45° 0′
Al-Beidha, E. Aden Prot.	<500	14° 50′	49° 50′
Al-Hadba, E. Aden Prot.	<500	Near Mukalla.	
Amd Town, E. Aden Prot.	3,100	15° 30′	48° 10′
Am Riga, W. Aden Prot.	1,000	13° 0′	44° 35′
Anag, E. Aden Prot.	3,000	15° 35′	48° 13′
Anaiza, E. Saudi Arabia	2,000	26° 9′	44° 10′
Arad, Bahrein	<500	Not Located.	
Awabil, W. Aden Prot.	6,500	13° 50′	44° 50′
Azriki, W. Aden Prot.	5,000	13° 45′	44° 40′
Baremie, Oman	1,000	23° 58′	55° 59′
Basaitin, Bahrein	500	26° 17′	50° 36′
Birket Ghail Masnah, Yemen	7,300	14° 20′	44° 20′
Birket Ma'agel-Biet Myiad, Yemen	7,100	15° 20′	44° 10′
Birket Shiekh Kunnaf, Yemen	7,100	See San'a.	
Bir Said Alî, W. Aden Prot.	<500	13° 5′	45° 0′
Buaish, E. Aden Prot.	<500	14° 35′	49° 20′
Buraiman, W. Saudi Arabia	<500	21° 35′	39° 12′
Burum, E. Aden Prot.	<500	14° 20′	48° 50′
Dahamis (Wadi), Socotra	1,500	12° 30′	54° 10′
Dammam, E. Saudi Arabia	<500	26° 15′	50° 5′

Locality.	Approximate altitude (ft.).	Approximate latitude and longitude. N.	E.
Dar al-A'mir, W. Aden Prot.	<500	12° 55′	45° 0′
Darsait, Oman	<500	23° 38′	58° 32′
Devil's Creek, Socotra	—	Not Located.	
Dhahran, W. Saudi Arabia	6,000	17° 30′	44° 0′
Dhamar, Yemen	7,400	14° 32′	44° 27′
Diraz, Bahrein	<500	26° 13′	50° 28′
Dis Town, E. Aden Prot.	<500	14° 50′	49° 50′
Dmeith, Trucial Oman	—	Not Located.	
D'thala, W. Aden Prot.	4,800	13° 41′	44° 45′
Dubai, Trucial Oman	<500	24° 52′	55° 15′
El-Ajam, E. Saudi Arabia	<500	26° 33′	49° 57′
El-Amra, Yemen	3,500	13° 40′	44° 0′
El-Hauban, Yemen	3,700	13° 34′	44° 6′
El-Kelba, Trucial Oman	<500	25° 1′	56° 20′
El-Kharj, E. Saudi Arabia	1,000	23° 51′	47° 28′
El-Khobar, E. Saudi Arabia	<500	26° 6′	50° 9′
El-Waht, W. Aden Prot.	<500	13° 0′	45° 0′
Fewa, E. Aden Prot.	<500	14° 30′	49° 0′
Gaixan, Oman	?	Near Muscat.	
Galali, Bahrein	<500	26° 18′	50° 40′
Geidun, E. Aden Prot.	900	15° 30′	48° 25′
Geregeri, E. Aden Prot.	<500	14° 50′	49° 50′
Gheil Bawazir, E. Aden Prot.	<500	14° 48′	49° 20′
Goor, Socotra	?	12° 30′	54° 15′
Hada, Yemen	8,000	15° 20′	44° 10′
Hadibo, Socotra	<500	12° 37′	54° 5′
Hajrein, E. Aden Prot.	3,000	15° 30′	48° 25′
Hami, E. Aden Prot.	<500	14° 45′	48° 45′
Hami al-Sharq, E. Aden Prot.	<500	14° 40′	49° 40′
Hamman 'Ali, Yemen	5,000	14° 40′	44° 10′
Hardeba, W. Aden Prot.	4,000	13° 30′	44° 47′
Harshiyat, E. Aden Prot.	<500	14° 35′	49° 10′
Haski, W. Aden Prot.	<500	13° 5′	44° 50′
Hauta (Hajr), E. Aden Prot.	<500	14° 25′	48° 10′
Hayoo, Socotra	<500	12° 38′	53° 37′
Hima, W. Saudi Arabia	4,000	18° 0′	44° 20′
Hiswa, W. Aden Prot.	2,000	15° 40′	47° 50′
Hodeida, Yemen	<500	14° 48′	42° 55′
Hoffuf, E. Saudi Arabia	<500	25° 23′	49° 30′
Huweimi, W. Aden Prot.	3,000	13° 23′	44° 29′
Jadaliya, W. Saudi Arabia	6,200	17° 25′	43° 40′
Jebel el-Scharr, W. Saudi Arabia	9,000	27° 30′	35° 45′
Jebel Jehaf, W. Aden Prot.	7,500	13° 45′	44° 40′
Jedda, W. Saudi Arabia	<500	21° 32′	39° 10′
Jizwal, E. Aden Prot.	<500	14° 40′	48° 45′
Jol Bahawa, E. Aden Prot.	<500	14° 28′	48° 24′
Jurbaib, Oman	<500	17° 0′	54° 0′
Kallansiya, Socotra	<500	12° 39′	53° 38′
Kameran I., Yemen	<500	15° 25′	42° 35′
Kathub, Socotra	<500	12° 36′	54° 0′

Locality.	Approximate altitude (ft.).	Approximate latitude and longitude. N.	E.
Katif, E. Saudi Arabia	<500	26° 32′	50° 1′
Khalla, W. Aden Prot.	800	13° 30′	44° 50′
Khars (? Khurus), Trucial Oman	1,000	24° 15′	56° 0′
Khirba, E. Aden Prot.	<500	14° 30′	48° 55′
Khirbat Bakarman, E. Aden Prot.	3,000	15° 20′	48° 10′
Khon, E. Aden Prot.	500	16° 10′	49° 10′
Khor Hadjun, Socotra	<500	12° 33′	53° 53′
Kirsh, W. Aden Prot.	3,000	13° 22′	44° 30′
Kod, W. Aden Prot.	<500	13° 5′	45° 20′
Lahej, W. Aden Prot.	<500	13° 3′	44° 53′
Madaneya, W. Saudi Arabia	2,000	Medina area.	
Madinat el-Abid, Yemen	4,000	14° 40′	43° 59′
Madruga, W. Saudi Arabia	2,000	22° 0′	40° 0′
Mahfud, E. Aden Prot.	3,000	15° 20′	47° 10′
Manama, Bahrein	<500	26° 14′	50° 33′
Mecca, W. Saudi Arabia	2,000	21° 25′	39° 54′
Mehmida, E. Aden Prot.	500	14° 28′	48° 50′
Meifa, E. Aden Prot.	500	14° 20′	48° 50′
Mikhuras, W. Aden Prot.	6,000	14° 0′	46° 0′
Mouri, Socotra	<500	12° 36′	53° 59′
Muharrak, Bahrein	<500	26° 16′	50° 36′
Mukalla, E. Aden Prot.	<500	14° 31′	49° 8′
Murawah, Yemen	<500	14° 50′	43° 25′
Muscat, Oman	<500	23° 37′	58° 36′
Museimir, W. Aden Prot.	3,000	13° 27′	44° 37′
Nafhun, E. Aden Prot.	3,000	15° 28′	48° 7′
N'Air, E. Aden Prot.	3,000	15° 32′	48° 12′
Nee, Socotra	?	12° 27′	54° 16′
Nobat Dakim, W. Aden Prot.	1,100	13° 15′	44° 40′
Qaidun, E. Aden Prot.	3,000	15° 20′	48° 20′
Qoreina, W. Aden Prot.	3,000	13° 23′	44° 30′
Ras el-Khamar, Trucial Oman	<500	25° 50′	56° 0′
Ras Shoab, Socotra	<500	12° 30′	53° 30′
Ras Tanura, E. Saudi Arabia	<500	26° 40′	50° 5′
Rifa a-Ash Sharqi, Bahrein	<500	26° 7′	50° 34′
Rouda, Yemen	7,100	15° 24′	44° 12′
Rubat Bakhoban, E. Aden Prot.	3,000	15° 20′	48° 10′
Rukub, E. Aden Prot.	<500	14° 30′	49° 15′
Safwa, E. Saudi Arabia	<500	26° 40′	49° 58′
Sahwa, E. Aden Prot.	2,000	15° 40′	47° 50′
Saihat, E. Saudi Arabia	<500	26° 10′	50° 5′
Sakhir, Bahrein	<500	26° 1′	50° 31′
Salalah, Oman	<500	17° 0′	54° 6′
Salim, W. Aden Prot.	<500	12° 50′	44° 55′
Sana, E. Aden Prot.	2,000	15° 40′	47° 50′
San'a, Yemen	7,100	15° 22′	44° 12′
Se'harr (? Sohar), Oman	<500	24° 23′	56° 45′
Seiyun, E. Aden Prot.	2,300	15° 57′	48° 47′
Sharja, Trucial Oman	<500	25° 9′	55° 33′
Sheikh 'Othman, W. Aden Prot.	<500	12° 53′	45° 3′

Locality.	Approximate altitude (ft.).	Approximate latitude and longitude. N.	E.
Shi Aera, W. Saudi Arabia		Near Qunfida.	
Shibam, E. Aden Prot.	2,500	15° 56′	48° 37′
Shihr, E. Aden Prot.	<500	14° 43′	49° 33′
Shinas, Oman	<500	24° 27′	56° 35′
Shuabat Amudi, E. Aden Prot.	3,000	15° 20′	48° 10′
Shuqra, W. Aden Prot.	<500	13° 20′	45° 50′
Sidab, Oman	<500	23° 36′	58° 36′
Sidara, E. Aden Prot.	500	14° 30′	48° 8′
Steamer Point, W. Aden Prot.		See Aden.	
Sukhal al-Dis, E. Aden Prot.	<500	14° 50′	49° 50′
Suleimiya, E. Saudi Arabia	1,000	24° 0′	47° 30′
Sulek, W. Aden Prot.	1,500	13° 30′	44° 50′
Taif, W. Saudi Arabia	6,200	21° 17′	40° 22′
Ta'izz, Yemen	4,100	13° 34′	44° 3′
Tarfaa, W. Saudi Arabia	500	21° 20′	39° 30′
Tarim, E. Aden Prot.	2,200	16° 2′	49° 0′
Thilla, E. Aden Prot.	<500	Near Mukalla.	
Tor um Baha, W. Aden Prot.	1,500	13° 5′	44° 20′
Ulub, W. Aden Prot.	3,000	13° 30′	44° 42′
Urfat Subai, E. Aden Prot.	<500	14° 50′	49° 50′
Usaifira, Yemen	4,000	13° 35′	44° 2′
Wadi Bait al-Falaj, Oman	<500	23° 36′	58° 32′
Wadi Dhahr, Yemen	7,000	15° 20′	44° 0′
Wadi Duan, E. Aden Prot.	3,000	15° 30′	48° 20′
Wadi Grab, Yemen	7,300	14° 40′	44° 25′
Wadi Hidaba, W. Aden Prot.	3,000	13° 20′	44° 30′
Wadi Killiem, Socotra		Not located.	
Wadi Liya, W. Saudi Arabia	<500	17° 0′	43° 0′
Wadi Ma'adin, W. Aden Prot.	1,500	13° 5′	44° 20′
Wadi Mal el-Ghail, Yemen	6,500	14° 50′	44° 0′
Wadi Maseila, E. Aden Prot.	<500	15° 50′	50° 0′
Wadi Maurio, Socotra		Not located.	
Wadi Natid, W. Aden Prot.	3,000	13° 30′	44° 30′
Wadi Raidan, Yemen	3,000	13° 30′	43° 50′
Wadi Rishan, Yemen		Not located.	
Wadi Siham, Yemen	1,000	14° 50′	43° 30′
Wadi So'lu, Yemen		Not located.	
Wadi Tiban, W. Aden Prot.	1,000	13° 15′	44° 45′
Wadi Tintern, Socotra	500	12° 30′	54° 10′
Wadi Worazan, Yemen	3,500	13° 30′	44° 25′
Wadiyain, W. Aden Prot.	1,000	15° 30′	47° 0′
Wasita, E. Aden Prot.	<500	14° 50′	49° 50′

ZOOGEOGRAPHY

General considerations.

The Arabian peninsula, together with North Africa, forms the meeting place of the Palaearctic and Ethiopian zoogeographical regions. Early zoogeographers such as Wallace and Sclater owned to an almost total ignorance of the Arabian fauna and

compromised by drawing the boundary between the two regions as a line running due east and west half way down the peninsula (Wallace) or treating the whole peninsula as Ethiopian (Sclater). Chapin (1923 : 121) substituted a line approximately defining the high ground in the south-west of the peninsula and running south-east from the neighbourhood of Jedda to reach the coast, opposite the Kuria Muria Islands, in Oman. This line was slightly modified at its eastern end by Chapin (1932 : 90). It was based on the distribution of the Arabian birds but was accepted by Edwards (1941 : 452) for the mosquitoes. It is shown in Text-fig. 4 (p. 115). It will be seen that most of western Saudi Arabia lies north and east of the boundary in the Palaearctic Region. Conversely a part of Oman, including Dhufar, lies to the west of the boundary in the Ethiopian Region. One of the most unfortunate gaps in our knowledge is the complete absence of any mosquito records from the Qara Mountains in Dhufar. As it is, our only records from this territory are from coastal localities (*Culex pipiens fatigans*, *C. sitiens* and *C. tritaeniorhynchus* from Salalah and *Anopheles coustani* var. *tenebrosus* from Jurbaib). All four forms are widely distributed in both major regions, but the last is known only from eastern and not from western Arabia. and this inclines us to question the propriety of extending the boundary so far east. Aside from this it is in good accordance with the distribution of the mosquitoes in so far as it is known to us.* Since almost all our records from western Saudi Arabia come from within or very near to the Ethiopian portion of that territory and only the Dhufar records come from outside the Palaearctic portion of Oman, it is convenient for the purpose of the present paper to treat western Saudi Arabia, the Yemen and the eastern and western Aden Protectorates as Ethiopian and the remaining political divisions of the peninsula as Palaearctic (Table I, p. 127). The island of Socotra has one endemic species, a number of species common to both major regions and one subspecies (*An. culicifacies adenensis*) which is wholly, or almost wholly, Ethiopian. It was included by Edwards (1941) in the Ethiopian Region but we have preferred to treat it as Palaearctic since several of its species (*Anopheles dthali*, *Aëdes caspius*, *Culex laticinctus* and *sinaiticus*), although admittedly having a restricted distribution in the Ethiopian Region, are mainly Palaearctic, while none (other than *An. adenensis*) can be said to be predominantly Ethiopian. The affinities of the endemic species, *Aëdes granti* are somewhat obscure (Mattingly, 1953 : 17) but they are certainly not Ethiopian.

The Ethiopian element in the fauna

Table I shows the Arabian mosquitoes grouped according to the main political divisions in which they occur and gives a rough picture of the composition of the Palaearctic and Ethiopian elements in the fauna and the extent to which they intermingle. The picture thus diagrammatically presented is, however, misleading in certain respects. This is so mainly because it fails to take sufficient account of the occurrence in the Ethiopian fauna itself of numerous Palaearctic intrusions. Thus *Anopheles multicolor* and *turkhudi* and *Culex molestus* are known only from a restricted area in the extreme north-eastern corner of the Ethiopian Region and are widely

* Meinertzhagen (1954 : 33) prefers to treat the whole peninsular as Palaearctic, but with this we cannot agree.

TABLE I.—*Distribution of the Arabian mosquitoes.*

Species.	Ethiopian.				Palaearctic.				
	Yemen.	W. Aden Prot.	W. Saudi Arabia.	E. Aden Prot.	Socotra.	E. Saudi Arabia.	Bahrein.	Trucial Oman.	Oman.
Aëdes natronius	×	—	—	—	—	—	—	—	—
Culex arbieeni	×	—	—	—	—	—	—	—	—
Culex salisburiensis	×	—	—	—	—	—	—	—	—
Culex sp. indet.	×	—	—	—	—	—	—	—	—
Culex nebulosus	×	—	—	—	—	—	—	—	—
Culex mattinglyi	×	—	—	—	—	—	—	—	—
Culex simpsoni	×	—	—	—	—	—	—	—	—
Anophles demeilloni	×	×	—	—	—	—	—	—	—
Anopheles pretoriensis	×	×	—	—	—	—	—	—	—
Aëdes hirsutus var. adenensis	—	×	—	—	—	—	—	—	—
Culex decens	×	×	—	—	—	—	—	—	—
Culex duttoni	—	×	—	—	—	—	—	—	—
Culex ethiopicus	×	×	—	—	—	—	—	—	—
Culex theileri	×	×	—	—	—	—	—	—	—
Anopheles coustani t.f.	—	—	×	—	—	—	—	—	—
Anopheles cinereus	×	×	×	—	—	—	—	—	—
Anopheles pharoensis	×	—	×	—	—	—	—	—	—
Anopheles turkhudi	×	×	×	—	—	—	—	—	—
Aëdes arabiensis	—	×	×	—	—	—	—	—	—
Culex tigripes	×	×	×	—	—	—	—	—	—
Culex pipiens var. molestus	—	—	×	—	—	—	—	—	—
Anopheles gambiae	×	×	×	×	—	—	—	—	—
Anopheles rhodesiensis rupicolus	×	×	—	×	—	—	—	—	—
Aëdes caballus	—	—	—	×	—	—	—	—	—
Aëdes vittatus	—	×	—	×	×	—	—	—	—
Anopheles sergenti	×	—	×	×	—	×	×	—	—
Anopheles culicifacies adenensis	×	×	—	—	×	—	—	×	—
Anopheles multicolor	—	—	×	—	—	×	—	×	—
Culiseta longiareolata	×	×	×	—	—	×	—	×	—
Culex pipiens t.f.	×	×	×	×	—	×	—	×	—
Aëdes aegypti	×	×	×	×	×	—	×	×	×
Anopheles dthali	×	×	×	×	×	—	—	—	×
Culex laticinctus	×	×	×	×	×	—	—	—	×
Culex pipiens fatigans	×	×	×	×	×	—	×	×	×
Culex sinaiticus	×	×	—	×	×	×	—	—	×
Culex sitiens	×	×	×	×	×	—	—	×	×
Culex tritaeniorhynchus	×	—	—	×	×	×	—	—	×
Aëdes granti	—	—	—	—	×	—	—	—	—
Culex pusillus	—	—	—	—	—	×	—	—	—
Anopheles pulcherrimus	—	—	—	—	—	×	×	—	—
Aëdes caspius	—	—	—	—	×	×	×	—	—
Anopheles coustani tenebrosus	—	—	—	—	—	×	—	—	×
Anopheles culicifacies t.f.	—	—	—	—	—	—	×	×	×
Anopheles fluviatilis	—	—	—	—	—	×	×	—	×
Anopheles stephensi	—	—	—	—	—	×	×	×	×
*Culex univittatus**	×	—	—	—	—	—	—	—	×

* It is probable that *C. univittatus* is represented by the type form in the Yemen and by var. *perexiguus* Theobald in Oman. If this should prove to be the case then the type form would be listed after *C. simpsoni*, the variety remaining at the foot of the table.

distributed outside it. These cannot be regarded as Ethiopian species in any sense of the term. Nor in our view can *Culex arbieeni* with its remarkable discontinuous distribution in both regions and its predominantly Palaearctic affinities (*infra*, p. 135, and see Mattingly, 1955*b*). Borderline cases include *Culex theileri*, *Anopheles rhodesiensis rupicolus* and *Aëdes vittatus*. *C. theileri* is very widely distributed in the Mediterranean Sub-region of the Palaearctic. In the Ethiopian Region it is confined to the eastern highlands and to South Africa and it might be regarded either as a Palaearctic intruder which has spread southwards or as a south African species which has spread northwards along the East African Highlands. *Anopheles rupicolus* has only a restricted distribution in the north-eastern corner of the Ethiopian Region, but its distribution in the Palaearctic is also very restricted and it is, in fact, known there only as isolated relict populations from the Sinai Peninsula and the Kuweira Upland in Transjordan (Lumsden in Leeson *et al.*, 1950 : 83). *Aëdes vittatus* is very widely distributed in the Ethiopian Region and has only a very limited distribution in the Palaearctic (Tel of Algeria, Spain, Balearic Is., Corsica and the eastern end of the French Pyrenees). It is, however, widely distributed in the Oriental Region (for details see Mattingly, 1952 : 292). *Aëdes caballus* is a predominantly Ethiopian species widely distributed in East and South Africa. It is, however, largely coastal over much of its range and is known also from the eastern shore of the Gulf of Oman (Djask). *Anopheles pharoensis* is also widely distributed in the Ethiopian Region. It occurs outside it only in Egypt and Palestine. Endemic Arabian species include *Aëdes arabiensis*, *Culex mattinglyi* and *Culex sp. indet.* The affinities of the two latter are doubtful, but they are perhaps Ethiopian. *Aë. arabiensis* undoubtedly has Palaearctic affinities. It is a close relative of the Holarctic, Oriental and Australasian *Aëdes vexans* Meigen which occurs nowhere in the Ethiopian Region. It may be compared to *Culex salisburiensis* which is widely distributed in East and South Africa and is purely Ethiopian in its range although it is closely related to the Palaearctic *Culex deserticola* Kirkpatrick. Summarizing this section of the fauna it may be said that the only purely Ethiopian species (other than Arabian endemics) which are found in Arabia are *Anopheles cinereus*, *demeilloni*, *gambiae* and *pretoriensis*, *Aëdes hirsutus* and *natronius* and *Culex tigripes*, *salisburiensis*, *nebulosus*, *decens*, *duttoni* and *ethiopicus*. We thus arrive at a minimum figure of twelve Ethiopian species out of a known total for the whole of Arabia of forty-two. Adding to these *Anopheles coustani*, *pharoensis* and *rhodesiensis*, *Aëdes arabiensis*, *caballus* and *vittatus* and *Culex mattinglyi* and *sp. indet.* we obtain an upper figure of twenty. Thus it may be said that the Ethiopian element makes up from about 30–45% of the Arabian mosquito fauna. When it is observed that all except one of these species (*Anopheles coustani*) are found exclusively to the south-west of Chapin's line it will be seen that there is ample justification for treating the area so defined as part of the Ethiopian Region.

The Oriental element in the fauna.

The Ethiopian element in the Arabian mosquito fauna, as here defined, is a large one. Nevertheless its size is, as we have indicated, liable to exaggeration by the inclusion of species which are mainly Palaearctic and have only a very limited

distribution in the Ethiopian Region. The same applies with even greater force to the Oriental element. Seventeen of the Arabian species penetrate to a greater or less extent into the Oriental Region and a number of these are often described as Oriental species. As Table II shows, however, this is, in many cases, grossly misleading and only *Anopheles culicifacies* and *fluviatilis* and *Culex tritaeniorhynchus* can be accepted unequivocally as Oriental in the sense that the major part of their range lies within that region. To them may perhaps be added *Anopheles stephensi*, but its wide distribution in India appears to be very nearly balanced by its equal abundance in Irak and southern Iran. *Anopheles turkhudi* is a borderline case, but it is restricted to western India and in terms of area the bulk of its range undoubtedly lies in the Palaearctic. *Aëdes aegypti* and *Culex pipiens fatigans* are cosmotropical forms which have been widely distributed by Man so that they cannot be considered in the present

TABLE II.—*Distribution of Arabian Mosquitoes Found also in the Oriental Region.*

Species	Mediterranean Subregion.	N. India.	Central & S. India.	Far East.
Anopheles dthali	×	×	—	—
Anopheles multicolor	×	×	—	—
Anopheles pulcherrimus	×	×	—	—
Anopheles sergenti	×	×	—	—
Culiseta longiareolata	×	×	—	—
Aëdes caspius	×	×	—	—
Culex theileri	×	×	—	—
Culex univittatus	×	×	—	—
Anopheles stephensi	×	×	×	—
Anopheles turkhudi	×	×	×	—
Anopheles culicifacies	×	×	×	×
Anopheles fluviatilis	×	×	×	×
Aëdes aegypti	×	×	×	×
Aëdes vittatus	×	×	×	×
Culex pipiens fatigans	×	×	×	×
Culex sitiens	×	×	×	×
Culex tritaeniorhynchus	×	×	×	×

context without certain reservations. The natural range of *Aëdes aegypti* would appear to be in the Ethiopian and Palaearctic Regions and that of *C. fatigans* possibly in the Oriental. *Culex sitiens* has also undoubtedly had its range extended by Man. Reasons are given below (p. 129) for supposing that its original area of distribution may have been in the south-eastern corner of the Palaearctic Regions. *Aëdes vittatus*, having separate Oriental, Ethiopian and Palaearctic populations, cuts across any arbitrary scheme of classification. Of the remaining species shown in Table II all are widely distributed outside the Oriental Region and have only a very limited distribution within it. They are either restricted to the extreme North-west of India (*Anopheles dthali, multicolor, sergenti, Aëdes caspius*) or spread eastwards from there along the Himalayan foothills (*Culiseta longiareolata, Culex theileri*) or have a limited southward extension into the United Provinces (*Anopheles pulcherrimus, Culex univittatus*). The Oriental element may thus be said to be represented

at the lower limit by three species (*Anopheles culicifacies, fluviatilis, Culex tritaeniorhynchus*) and to these *Anopheles stephensi, Culex sitiens* and *Culex fatigans* may be added giving an upper limit of six species or roughly 7½%–15% of the whole. Apart from *Culex fatigans* these species are mainly coastal with limited penetrations of the hinterland by *An. stephensi* in the Hoffuf area, *An. culicifacies adenensis* behind Aden and *Cu. tritaeniorhynchus* in the Yemen. To them may be added a rather dubious element in Socotra, represented by *Aëdes granti*, and another in the western highlands represented by *Anopheles turkhudi* and *Aëdes vittatus*. The latter may, however, well represent a simultaneous invasion of India and Arabia from the Palaearctic. With it may be associated *Culex tigripes* which, though now purely Ethiopian, has its only close relatives in the Oriental Region. The most strongly Oriental part of our area is the Bahrein Islands with three Oriental, three Palaearctic and two cosmotropical species. We have no reason to regard any part of the area as predominantly Oriental and are in agreement with the majority of zoogeographers who would choose as the boundary of the Oriental Region either the eastern frontiers of Afghanistan and Baluchistan (following Wallace) or the eastern frontier of Southern Irak and the mid-line of the Persian Gulf (following Sclater).

Unrecorded species from neighbouring territories

On the basis of the foregoing remarks and having regard to our knowledge of their bionomics a few suggestions may perhaps be hazarded as to those species not so far recorded from the Arabian area but which may possibly be found there. Among species known to occur both in India and in Africa south of the Sahara the majority are probably excluded by their rainfall and vegetational requirements (although some surprises may yet await us in the high Yemen). These include *Aëdes* (*Mucidus*) *scatophagoides* Theobald, *Aëdes* (*Stegomyia*) *unilineatus* Theobald and *albopictus* Skuse, the latter in the islands of the Malagasy subregion only, *Aëdes* (*Banksinella*) *lineatopennis* Ludlow and *Culex* (*Culex*) *bitaeniorhynchus* Giles. Of these the most likely to be found is, perhaps, *Aëdes unilineatus*, which is capable of a high degree of drought resistance (Mattingly, 1952 : 288, 1953*a* : 54). Most of the Eritrean Culicini listed by Lewis (1943) have been found in S.W. Arabia. Among those which have not, attention should perhaps be drawn to *Aëdes* (*Aëdimorphus*) *eritreae* Lewis which has an unknown larva. Ethiopian species extending into Egypt include *Culex* (*Culex*) *antennatus* Becker (which also occurs in Palestine) and (*Culex* (*Culex*) *poicilipes* Theobald, both of which might be found at least in the north. Of Palaearctic species. *Anopheles hyrcanus* and *superpictus* have already been mentioned (p. 92). Lumsden (in Leeson *et al.*, 1950 : 83) considers that there is a strong possibility that *Anopheles hispaniola* Theobald will be found in Saudi Arabia. This possibility is certainly worth bearing in mind, especially in view of the fact that the adults are probably indistinguishable on external characters from those of *Anopheles cinereus*. The larva would run down on our key with *An. cinereus* and *An. turkhudi*. It differs from both in having normal mouth brushes and in other respects (notably in the shape of the palmate hair leaflets) resembles *An. cinereus*. Although it has frequently been compared to and even synonymized with *Anopheles turkhudi* there can be almost no doubt that it is the Mediterranean analogue of *Anopheles cinereus*

which it closely resembles in all stages.* Failure to recognize this seems to have been due mainly to the omission by Puri (1931 : 62) of *An. cinereus* from his Subdivision IV, Group 6, to which it undoubtedly belongs. Further confusion was added by an unfortunate footnote by Edwards (in Evans, 1938 : 336) in which he synonymized *An. hispaniola* with *An. turkhudi*.This led to the omission of the former from several widely used keys. Finally Smart (1948 : 159) makes confusion worse confounded by keying *An. hispaniola* as though it has only one (instead of both) of the long mesopleural bristles feathered. Other Palaearctic species which may possibly be encountered in northern Arabia are *Culex* (*Neoculex*) *deserticola* Kirkpatrick and *Culex* (*Lasiosiphon*) *adairi* Kirkpatrick. The former is liable to confusion with *Culex salisburiensis* to which it is closely related. Both have been found in the North Galala Mountains in the eastern desert of Egypt. Species recorded from southern Irak, but not so far from Arabia, include *Culiseta* (*Culiseta*) *subochrea* Edwards and *Culex* (*Culex*) *vishnui* Theobald. *Culex* (*Neoculex*) *quettensis* Mattingly (1955*b*) from Baluchistan is perhaps also worth mentioning. Among Oriental species *Anopheles subpictus* has already been mentioned (p. 92). In view of the smallness of the Oriental element in the Arabian fauna it does not seem likely that many other true Oriental species will be encountered.

Distribution within the Arabia area.

Owing to the absence or extreme paucity of records from many parts of our area little can usefully be said on this subject. An interesting example of a restricted north-south distribution is afforded by *Anopheles multicolor* which has not been found further south than Jedda in the West and Trucial Oman in the East. This is a mainly desert species which is apparently excluded from the Yemen, on the one hand, and the Muscat hinterland, on the other, by their relatively heavy rainfall. *Anopheles sergenti* has a somewhat similar distribution ; and another comparable case is perhaps that of *Aëdes arabiensis*, which is known from the Aden hinterland and the Jedda area but not from the wetter area which lies in between. In contrast to this a number of Ethiopian species are known only from the Yemen and may well be confined to that area by their need for a relatively heavy rainfall. The problem of how these species reached the Yemen is an interesting one and it seems that some light might be thrown on it by a detailed study of *Anopheles pharoensis*. The Mediterranean and Ethiopian forms of this species appear to be geographically isolated at the present time and it may be that small differences could be detected and could be used in comparing the two forms with that occurring in the Yemen.

Concerning east-west distributions there is even less to be said. Most species common to both sides of the peninsula give the impression of having spread down from the north. *Anopheles culicifacies* and *Culex tritaeniorhynchus* may be thought to have spread westwards along the southern coast, possibly with the assistance of Man and the occurrence of *Aëdes caballus* at Djask (p. 128) might be thought to indicate an extension of range in the opposite direction. It could, however, well be a

* Raffaele (1954) arrives independently at a similar conclusion. He considers that two species are probably confused under the name *An. hispaniola*. It is hoped to discuss this matter in more detail in the second part of this paper.

human introduction. Light on this and other problems might well be shed by exploration of the Qara Mountains in Dhufar and the mountains behind Muscat. The mosquito fauna of both is entirely unknown.

The altitudinal distribution of certain species has points of interest, but again our knowledge is limited and we have no knowledge of altitudes above a thousand feet in Oman and Trucial Oman. On the western face of the central highlands of the Yemen, the southern face of the highlands of the Aden Protectorates and the Qara Mountains and the eastern face of the mountains of Oman rainfall may be expected to increase steadily with altitude and may be even more important than the temperature gradient in controlling the distribution of mosquitoes. It is not, therefore, surprising to find a number of Ethiopian species apparently restricted to high altitudes in Arabia although they occur down to sea level elsewhere. Knight (1953*b* : 214), following Petrie, gives an average rainfall of about 2½ in. for the coastal plain and 14–15 in. for the central highlands of the Yemen. The Rainfall Map of Eastern Africa (East African Forces No. 1518) shows over 30 in. for the central highlands eastwards from San'a to the neighbourhood of Tarim. This figure seems high, but in any event there do not appear to exist any continuous observations over a sufficient period of years to provide reliable normals. Drainage from the uplands may be expected to provide high subsoil and surface water levels at intermediate altitudes and thus to create vegetational and other conditions more suitable for mosquitoes than might be expected solely from a consideration of local rainfall. Species found at altitudes of 7,000 ft. or more include *Anopheles cinereus, demeilloni* and *sergenti, Culiseta longiareolata, Aëdes vittatus* and *hirsutus, Culex tigripes, salisburiensis, mattinglyi, pipiens* and *theileri*. Most of these species have not been found below 3,500 ft. or more but *An. cinereus* has been found down to 1,500 ft. and *An. sergenti, Culiseta longiareolata* and *Aë. vittatus* down to sea-level. This extensive altitudinal range can be parallelled in the case of the two last species in the Ethiopian part of their range. Species occurring at intermediate altitudes (from 1,000 ft. to 6,500 ft.) include *An. coustani* t.f., *dthali, gambiae, pharoensis pretoriensis,* and *rupicolus, Aë. caballus* and *natronius* and *Culex arbieeni*, sp. *indet. nebulosus, decens, duttoni, ethiopicus, laticinctus, simpsoni, sinaiticus* and *univittatus*. Most of these species appear to be unable to exist in the very arid coastal plain, but *An. dthali* and *gambiae* and *Culex laticinctus, sinaiticus* and *univittatus* (Oman form) have been found down to sea-level. All these five species have been recorded as utilizing artificial collections of water (wells, cisterns, tanks, basins, temporary pools) in other parts of their range. It is remarkable that *C. duttoni* and *C. nebulosus* are not among their number, since elsewhere these species are markedly peridomestic. The remaining species are mostly confined to the coastal plain, but *An. multicolor* and *stephensi, Aë. caspius* and *Culex pusillus* are recorded from up to about 1,000 ft. and may go higher since we have no records from altitudes above this in the part of Arabia where they occur. *Culex tritaeniorhynchus* appears to go up to about 1,000 ft. in the Yemen (the only inland record from the Ethiopian part of its range) and *An. adenensis* penetrates up to about 500 ft. behind Aden. *Aëdes arabiensis* has not been clearly recorded from much above sea-level behind Aden, but it apparently goes up to 2,000 ft. further north. *Aëdes granti* was originally found in the " Dahamis Glen "

on Socotra and this appears to be at about 1,500 ft. It is possible that it is more abundant away from the coast, but our knowledge of the hill fauna of this island is extremely meagre. *Aëdes aegypti* is mainly coastal, as would be expected for the pale form, but it would seem that here, as elsewhere, there are exceptions (see Mattingly, 1953*a* : 46). The recorded altitudinal distribution of *C. pipiens pipiens* and *C. p. fatigans* behind Aden is anomalous, and one is led to suspect Patton of occasional misidentifications. If his records are accepted *C. p. fatigans* extends up to nearly 5,000 ft. (Dthala) and *C. pipiens* down to 1,100 ft. (Nobat). From a knowledge of their distribution elsewhere this seems somewhat unlikely (although not entirely out of court.) If the records are correct considerable overlapping occurs and this would be a good area in which to look for hybridization, but if the records from Dthala and Nobat are discounted then it is possible that they have a discontinuous distribution (*fatigans* up to 3,000 ft., *pipiens* down to 4,000 ft.).

The geological factor has been relatively little studied, but it is clearly very important in relation to mosquito distribution. In the Belgian Congo *Aëdes vittatus* is entirely confined to areas of ancient rocks and is absent from the sedimentary rocks of the Congo basin (Mattingly, 1954 : 51). This factor has not hitherto been studied in other parts of its range and it is interesting to find that in Arabia it is known only from the main area of igneous rocks in the west, the rocks of eastern Arabia being for the most part sedimentary. Unfortunately it is impossible to tell from the small-scale geological map available to us whether the same precise correlation holds good as in the Belgian Congo. The absence of *Aë. vittatus* from the Yemen is remarkable and it is perhaps worth noting that in similar country in central Spain it breeds in residual rock pools in the beds of torrential streams and has only a relatively short seasonal occurrence at the time when these are exposed but still water-filled. The Yemen has been the site of very intense volcanic activity, some of it continuing almost if not quite into recent times. It is not therefore surprising to find in that territory two species which appear to be particularly associated with volcanic conditions. *Aëdes natronius* is known with certainty from outside Arabia only from the highly volcanic area between Lake George and Lake Edward and from the neighbourhood of volcanic springs in Bwamba county, Uganda. Female adults of this species are not distinguishable with certainty from those of *Aëdes durbanensis* Theobald and it seems probable that the record of the latter species from Mt. Fantali in Abyssinia (Edwards, 1941 : 199) really refers to *Aë. natronius*. Conversely the record of *Aë. natronius* from Taveta in Kenya by Mrs. E. C. C. Van Someren (in Lumsden, 1955 : 161) probably refers to *Aë. durbanensis* which, although mainly a coastal species, has been recorded from inland localities in Tanganyika (Harris, 1942 : 183 ; Mattingly, 1954 : 59). The respective distributions of the two species require further investigation however. The point is an interesting one since it concerns the complex interrelationships between coastal, desert and plutonic mosquitoes, all of which are adapted to high concentrations of mineral salts in their breeding places. In this connection the close resemblance in certain features between the larvae of *Aëdes durbanensis, natronius, caballus, caspius, arabiensis, hirsutus* and *vittatus* (see above, p. 100) are worth noting, especially in view of the fact that these species are distributed, on adult characters, between three different subgenera.

The second Arabian species which may be tentatively associated with plutonic conditions is *Culex mattinglyi* (see Mattingly, 1954 : 58). Here, however, the association cannot be directly proved since this species has so far only been found in artificial breeding-places (details in Knight, 1953*b* : 216–217). This fact does not rule out the possibility of its occurrence in volcanic springs or pools, as is shown by the example of *Aëdes natronius*. The latter was originally found breeding in pools of extreme alkalinity and high temperature (Mattingly, 1954 : 59). Nevertheless larvae of the same species were found at the same time in fresh water nearby (Hopkins, 1952 : 207). Other instances could also be adduced to show that mosquitoes adapted to breeding in a specialized habitat and (as in the case of *Aë. natronius*) occurring in that habitat in very large numbers may " overflow " into more generalized habitats, even to the extent of supplanting the usual inhabitants over a limited area. This does not mean that such species are sufficiently plastic to become generally distributed, but it does argue a degree of plasticity which is not altogether negligible. In this connection, however, a word of warning is perhaps needed regarding the use of the term " fresh water ". In England *Aëdes caspius* is largely coastal in its distribution and it is undoubtedly capable of breeding in brackish water with a high degree of salinity. Nevertheless it occasionally appears in inland localities and there constitutes a serious nuisance. Only two such outbreaks have been thoroughly investigated (a third is being investigated at the present time) and in both these cases breeding has been found to be taking place in the purified effluents from sewage farms. Such effluents, although fresh in the sense of being free from organic contamination, frequently have a high chloride content. Callot and Dao-Van-Ty (1942) have a record from near Paris. In this case the breeding water was observed to have a high organic nitrogen content. The chloride content is not mentioned.* The wide distribution of this species in Central Europe (Edwards, 1921 : 300) suggests that this species is relatively plastic. Nevertheless over most of its range its presence appears to be associated with that of breeding waters having a high mineral salt content, whether as a result of proximity to the sea or of concentration by evaporation under desert conditions or of volcanic activity or from other causes. In contrast to this *Aëdes durbanensis*, while possessing larval characters typical of brackish water species and a largely coastal distribution, has never been found breeding in anything but " fresh " water (Mattingly, 1954 : 59). Intermediate between these extremes (if such they are) is *Aëdes caballus* which, in the northern part of its range (Eritrea) is found breeding mainly near the coast and in waters containing up to 4% chloride while in the Transvaal it occurs in depressions in the veldt temporarily filled with rain or irrigation water. In the latter case, particularly where rain water is concerned, it must be presumed that the breeding waters are genuinely fresh. To complete the picture it may be said that the type form of *Aë. hirsutus* has been found breeding mainly in temporary ground pools, after heavy rain, while the same is true of *Aë. arabiensis* in the Sudan although in Arabia it has been specifically recorded only from one of the tanks near Aden in company with *Aë. vittatus* (Patton, 1905 : 634 ; Hop-

* Professor Callot has informed us (*in litt.*) that *Aë. caspius* is quite often found in flooded meadows in Alsace in association with *Aë. vexans*. This is interesting because the same two species were found associated in a recent inland outbreak at Morden near London. *Aë. vexans* is a rare and very local mosquito in Britain, but this is one area in which it has been known for some time to be established.

kins, 1952 : 198). It is possible that it may share the preferred breeding-places of the latter species (rock holes) or it may resemble *Ae. hirsutus* in preferring pools in softer ground. The remarkable adaptation of *Aë. vittatus* to torrential conditions in central Spain had been noted above (p. 133) and it is possible that similar, at first sight surprising, adaptations may be found in other ground pool breeding Arabian *Aëdes*. Summarizing this group it may be said that several of the species are linked by their tolerance for high mineral salt contents in their breeding waters while most, if not all, possess in a marked degree the capacity for utilizing temporary breeding-places. The latter capacity argues, on the one hand, a tolerance of high temperatures in the breeding water and, on the other, a rapid larval development keeping pace with the equally rapid drying-up of the breeding places. This last has been specifically noted only for *Aëdes arabiensis* and *hirsutus* (Hopkins, 1952 : 198, 252), but it probably applies also in varying degrees to the other Arabian species. Finally, as an example of one further aspect of the distribution of desert mosquitoes, reference must be made to the remarkable case of *Culex arbieeni*. This species is known only from four localities which are very widely separated indeed and which lie at the four corners of a quadrilateral roughly embracing the Sahara desert. These localities are the island of Teneriffe (Canary Islands), the southern part of the Sinai Peninsula (Wadi Arbieen and Wadi Feiran, near Mt. St. Catherine), the Yemen and the Jebel Marra in the south-western Anglo-Egyptian Sudan. One point of interest about these records is that all are from areas of intense and relatively recent volcanic activity. No measurements of the mineral content of the breeding waters have been published and there is no reason to doubt that this species possesses the capacity to breed in fresh water. Nevertheless it is difficult to believe that it did not originally evolve as a plutonic species. The second point of interest concerns the extreme geographical discontinuity of the records coupled with the fact that, apart from certain differences in the mesonotal scaling, a very variable feature in *Culex*, there is little in the available material to indicate subspeciation. This suggests that the four populations may not have been very long isolated from one another, which would imply that the present rigorous desert conditions pertaining over much of the Sahara may be of relatively recent origin. For this there is much other evidence (see numerous papers by Joleaud, e.g. Joleaud, 1938). A comparable case is perhaps that of *C. univittatus* of which the Mediterranean form (var. *perexiguus* Theobald) occurs as far south as the Zaria area in Nigeria and may well be thought to have crossed the Sahara in comparatively recent times (Mattingly, 1954 : 56).

The last group of species to which reference will be made comprises the domestic and peridomestic species which are particularly closely associated with Man. *Culex nebulosus* and *Culex duttoni* have already been noted as belonging to this category (pp. 101, 102). Since they are known only from a single locality little can be said about them except that if they occur in Arabia at all it is surprising that they do not occur more widely. It seems possible that they may represent recent human introductions, perhaps by air, and it will be interesting to see whether they are recorded more frequently in future. Regarding *Aëdes aegypti* it has already been noted that this occurs in Arabia, as in many other parts of its range, as two distinct forms, the pale type form, originally described from Egypt, and a darker form, jet black over

most of Africa south of the Sahara, tending to be somewhat browner elsewhere, which is frequently, but erroneously, referred to as the type form. In Africa south of the Sahara the pale form is almost entirely coastal in its distribution with very limited penetrations inland along a few major lines of communication, and it is therefore considered to be an introduced form (Mattingly, 1953*a* : 46). It occurs to an unspecified extent in India (Barraud, 1934 : 222, 223) and Mr. Donald Colless has reported to us the occurrence of a very pale island population near Singapore. It is also known from northern Australia. Where the two forms come into contact, as in coastal regions in Africa, every degree of intergradation is encountered, strongly suggesting the occurrence of hybridization. Intermediates of this type, as well as fully pale forms, appear to occur in the West Indies and, very extensively, in the southern United States. The whole subject of the distribution of these forms is at present being studied and it is too soon to form a definite opinion, but the indications so far would not be inconsistent with a hypothesis that the natural range of the pale form is in Arabia, or perhaps the southern part of the Mediterranean Sub-region in general. It may or may not have had a natural extension into the Somalilands and it must certainly have been introduced by Arabs into coastal regions of East Africa at a comparatively early date. Extension of its range into West Africa may have come later. It may have been carried to the New World and to Australia and the Far East in the hybrid form. It is apparently more highly domestic than the dark form (Mattingly, 1955*a*) and its marriage with the latter may have been a factor of some importance in the history of urban yellow fever. The comparative bionomics of the two forms is, however, a subject requiring much further study, as indeed do all questions involving the genetics of behaviour in mosquitoes.

From a practical point of view the coexistence of pale and dark forms in a locality such as Mombasa (Teesdale, 1955) raises formidable problems of control, and it is plain that these can only be tackled on a rational basis in the light of studies on the genetics of the hybridizing populations. In recent genetical studies on *Aëdes aegypti* (Gillett, 1955*a*, *b*) there is reason to suspect that one of the strains employed may have been a pale-dark hybrid and this is a possibility which needs to be taken into account in all genetical work on this species. Genetical diversity between the strains employed is also indicated by the failure of Indian *Aë. aegypti* to cross with Indochinese *Aë. albopictus* with which Indochinese *Aë. aegypti* were known to be compatible (Toumanoff 1939). It is evident that in the past our approach to this important species has been altogether too naïve.

The same is true of the other principle culicine disease vector of Arabia, *Culex pipiens fatigans*. The question of hybridization between this subspecies and *C. p. pipiens* has been discussed above (pp. 102, 133) but it should also be noted that even within ssp *fatigans* there exists considerable divergence in Africa. Thus the East African Lowland form of *fatigans*, which the Arabian form may be tentatively supposed to resemble, is extremely abundant and widespread and bites Man avidly. The form found in certain parts of West Africa, on the other hand, is a rare mosquito, largely confined to the immediate vicinity of the ports, and, in general, will not bite Man at all. It is clear that this is an introduced form, though its origins are unknown. It will be evident that facts such as this will need to be taken into account in plan-

ning the control of this important pest—a difficult matter at the best of times, since it is, of all mosquitoes, perhaps the most resistant to D.D.T.

In conclusion a word may be said with regard to *Culex sitiens*. This is not strictly a domestic mosquito but it is closely associated with man, particularly in his travels, by reason of its ability to breed in highly brackish water in such places as the bottoms of boats and canoes. Its range has undoubtedly been considerably extended by human intervention and, since it is almost entirely coastal in its distribution throughout the tropics, there is little indication as to what its original distribution may have been. The British Museum has, however, some specimens of a very interesting inland population from Bandan in Seistan (eastern Iran) nearly 400 miles from the sea. The occurrence of *C. sitiens* so far inland suggests rather strongly that this may be its natural area of distribution and that it may have spread eastwards and westwa ds along the coasts from here. Similar arguments have been adduced by Mattingly (1953*a* : 46) with respect to the pale form of *Aëdes aegypti* in Africa, Reid (1954) with respect to the (mainly) dark form of this species in Malaya and Edwards (1941 : 299) with respect to *Culex tritaeniorhynchus* in Africa, each of these forms being postulated as a human introduction on the basis of its wholly or largely coastal distribution.

SUMMARY

A careful revision of existing material and records has led us to recognize 42 species of mosquitoes as occurring in the Arabian area. Three of these, *Anopheles demeilloni*, *Aedes caballus* and *Culex duttoni* are here recorded for the first time from Arabia. *Anopheles coustani* is represented both by the type form and a variety. *Culex univittatus* is also probably represented by at least two forms although this cannot be definitely established on the basis of the available material. *Aëdes aegypti* is represented both by the pale type form and by the dark form although the latter appears to be comparatively rare. Two species of *Anopheles* (*An. hyrcanus* and *An. subpictus*) have been recorded from the area but are omitted from our list as their presence has not, in our opinion, been conclusively proved. *Anopheles adenensis*, *macmahoni* and *rupicolus* are reduced to the status of subspecies of *Anopheles culicifacies*, *sergenti* and *rhodesiensis* respectively and *Anopheles arabicus* is relegated to the synonymy of *Anopheles fluviatilis*. The type of *Culex arabicus* Becker has been found on examination to be a specimen of *Aëdes caspius*. It is noted that the larva currently attributed to *Aëdes minutus* is in fact *Aëdes vittatus* and that records of *Culex thalassius* from Socotra are, in our view, erroneous. Keys for the identification of adults and fourth stage larvae are presented and in these we have included *An. hyrcanus* and *An. subpictus* as well as the important malaria vector *Anopheles superpictus*, which we consider will almost certainly occur in northern Arabia although it has not so far been recorded from there. *Anopheles hispaniola*, although not as yet recorded, may well be found in north-western Saudi Arabia. We have not included it in our keys since it is very difficult to separate from *Anopheles cinereus* and, in our opinion, a detailed comparative study of these two species is required. *An. hispaniola* has been synonymized by some authors with *An. turkhudi*, but there can be no doubt

that it is more closely related to *An. cinereus*. A number of species occur both in India and in tropical Africa although they are apparently absent from Arabia. In our view most of these are probably excluded by unfavourable climatic conditions although one or two may still await discovery. We have listed a number of Palaearctic species which may yet be found. The bulk of the Arabian mosquito fauna is Palaearctic although there is a considerable Ethiopian element in the south-west which amply justifies the inclusion of this part of Arabia in the Ethiopian Region. The mosquito fauna of Socotra, on the other hand, is, in our opinion, predominantly Palaearctic. The Oriental element in the Arabian fauna is extremely small and appears to be almost entirely coastal, although our complete ignorance of the fauna of the mountains of Oman and the Qara Mountains in Dhufar does not permit us to say to what degree it may extend inland in those areas. Certain distributions are discussed in detail and an account is given of a remarkable instance of clinal variation in *Aëdes caspius* and of convergence in larval characters as between *Aëdes vittatus* and *Aëdes arabiensis*. The distribution of these and other ground-pool breeding *Aëdes* is discussed in relation to geological factors. The interrelationship between desert, brackish water and plutonic species appears to be subtle and suggests some interesting studies in desert biology. The widely discontinuous distribution of *Culex arbieeni* is cited as suggesting considerable amelioration in the recent past of the conditions at present prevailing in the Sahara desert. The distribution of various species is discussed in relation to altitude which, in Arabia, is so closely bound up with rainfall that variations in the latter may well override in importance the usual temperature gradients. Behaviour differences as between the pale and dark forms of *Aëdes aegypti* are cited as exemplifying the need for genetical studies on the common domestic mosquitoes.

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MICROLEPIDOPTERA FROM LORD HOWE ISLAND AND NORFOLK ISLAND

J. D. BRADLEY

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Pp. 143–164; 26 *Text-Figures*

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By J. D. BRADLEY

I. LORD HOWE ISLAND

Lord Howe Island lies approximately 400 miles off the east coast of Australia on a slightly more northern latitude than Sydney, and was the first South Pacific island at which we called on the voyage from Australia to the Solomons. The ship anchored off Ned's Beach, and while cargo was being unloaded we had an opportunity to get ashore for an afternoon and again for most of the following day. On the second day ashore we crossed to the S.W. side of the island, a distance of not more than a mile, and made our way along the shore of the lagoon to the foot of Mt. Lidgbird, which is over 2,500 ft. high. Beyond could be seen the more massive Mt. Gower, rising to about 2,800 ft. We climbed a few hundred feet up the lower slopes of Mt. Lidgbird, passing through a dense forest of curly palm, *Howea belmoreana*, mixed with other trees, including huge banyans covering hundreds of square yards.

The larger Lepidoptera were extremely scarce, perhaps due to the strong winds of the past few days having driven them to seek sheltered places. Only one butterfly, a *Euploea* species, was observed during the whole time ashore. A small collection of twenty-two specimens of Microlepidoptera was secured. This has proved of considerable interest and is the subject of the present paper.

The material now studied includes twelve species, of which eight are apparently new to science and are described below, and four are known Australian species. The latter constitute new additions to the faunal list of Lord Howe Island.

The collection is in the British Museum (Natural History), including types and paratypes of species here described. Colour terms used in the descriptions below have in most instances been taken from Ridgway's *Color Standards and Color Nomenclature*.

Tortricidae

Tortrix aulacana Meyrick

Tortrix aulacana Meyrick, 1881, Proc. Linnean Soc. N.S. Wales, **6**: 513.

A male example captured among shrubs, "Lord Howe Island, Mt. Lidgbird, 19.viii.1953". Genitalia slide B.M. 3772.

This species occurs in N.S. Wales and Victoria in Australia, and in Tasmania. It belongs with *Tortrix postvittana* Walker in a new genus, a description of which is now in press and will appear in *Bull. ent. Res.* **47**, pt. 1.

Olethreutidae

Lobesia eustales sp. n.

♂ 5–6 mm. Labial palpus sordid white, second segment mixed with greyish fuscous. Head, thorax, antenna and scape sordid white mixed with greyish fuscous, tegula dark fuscous at base greyish fuscous at tip. Fore wing (rubbed) sordid white strongly and irregularly irrorated with greyish fuscous, markings poorly defined and diffuse, costa strigulated with dark fuscous, a dark fuscous marking at base, a dark fuscous patch on dorsum before middle, a small fuscous pretornal marking preceded by a weak circular patch of ochreous, an admixture of scattered ochreous-buff scales in discal area, termen outlined with small dark fuscous scales. Cilia greyish mixed with fuscous. Hind wing dark grey, cilia light grey.

Male genitalia (Text-fig. 1) : Valva narrow, cucullus densely clothed with long setae on inner side. Sacculus with a dense apical patch of setae. Aedoeagus curved, apex obliquely truncate, acute.

Type ♂ : " Lord Howe Island, Mt. Lidgbird, 19.viii.1953 " Genitalia slide B.M.3786. Paratype : 1 ♂, same data as type. Both examples caught flying over shrubs on the lower slopes of Mt. Lidgbird.

An apparently distinct species recognizable by the irrorate appearance of the fore wings.

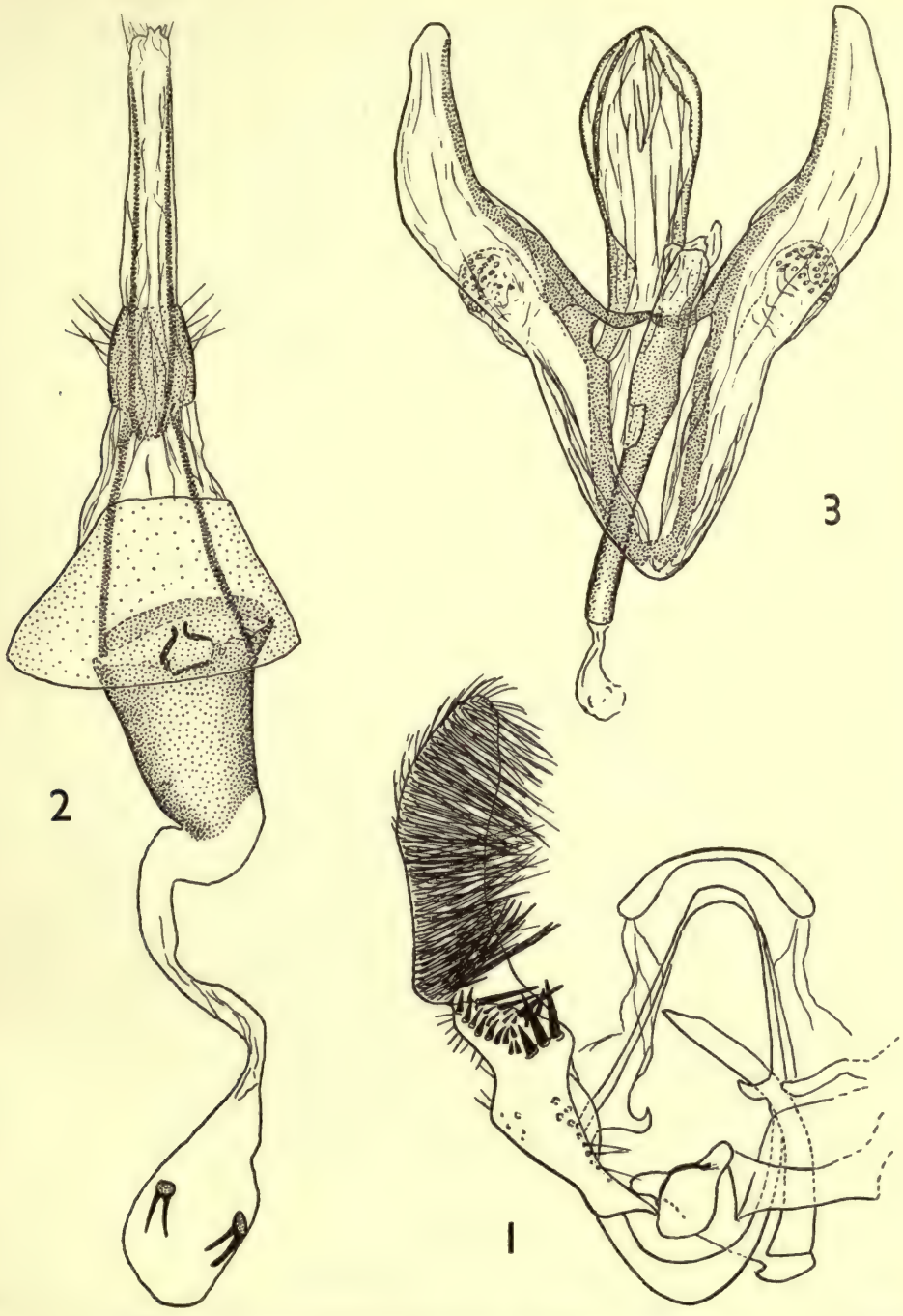
Carposinidae

Carposina euphanes sp. n.

♀ 20 mm. Labial palpus about two and a half times length of head, white above, sprinkled with dark fuscous beneath. Head whitish, chaetosema pronounced and indicated by erect scales. Antenna greyish fuscous, scape whitish lightly suffused with fuscous. Thorax and tegula whitish suffused with greyish fuscous. Fore wing whitish lightly suffused with greyish fuscous, a broad fuscous mixed with pale ochreous-buff marking at base extended along costa to about 1/5, a prominent tuft of raised fuscous-black scales with an admixture of ochreous-buff in disc at 1/3 followed by two small whitish grey tufts in the lower margin of cell, one at about middle and the other at 3/5, a larger fuscous mixed with whitish tuft of raised scales at upper angle of cell. Cilia whitish irrorated with minute specks of greyish fuscous. Hind wing and cilia whitish.

Female genitalia (Text-fig. 2) : Ovipositor long, lobes minute. Ostium very wide, well sclerotized, cup-shaped, a strongly sclerotized limen. Ductus bursae fairly short ; bursa copulatrix elongate bearing two signa, each with a pair of long prongs.

Type ♀ : " Lord Howe Island, Mt. Lidgbird, 19.viii.1953 ". Genitalia slide B.M.3524.



FIGS. 1–3.—(1) Ventral views of male and female genitalia. *Lobesia eustales* sp. n., male. (2) *Carposina euphanes* sp. n., female. (3) *Acrocercops tomia* sp. n., male.

The fascies of the fore wing and the structure of the female genitalia indicate affinities with the two New Zealand species *C. gonosemana* (Meyrick) and *C. epomiana* (Meyrick); but *euphanes* is distinguished by the solid marking at the base of the fore wing, and by the absence of the lateral and medial processes which project posteriorly from the ostium in the female genitalia of those two species.

Oecophoridae

Elaeonoma liquida (Meyrick)

Eulechria liquida Meyrick, 1914, Exotic Microlepidoptera, **1**: 164.

One female example caught on the lower levels, " Lord Howe Island, 18.viii.1953". The specimen is damaged due to having come unpinned while in transit, and the abdomen is missing.

This species is known from Queensland.

Elaeonoma aneusema sp. n.

♂ 11 mm. Labial palpus fuscous-black sprinkled with whitish scales, second segment narrowly ringed with white. Head, thorax, tegula and antenna greyish fuscous-black. Fore wing whitish heavily overlaid with greyish dark fuscous or mummy brown, a heavy mummy brown or fuscous suffusion at base, two conspicuous mummy brown or fuscous spots in middle at 2/3, the lower obliquely distad of the upper, a similar slightly larger spot at end of cell, an inconspicuous mummy brown marking between this and the upper basal dot and a similar marking on dorsum a little before tornus and another on costa above and slightly beyond the outer discal spot, a rather diffuse mummy brown subterminal line from tornus to costal marking. Cilia cream-buff lightly irrorated basally with mummy brown. The coloration of the fore wing varies; in one example it is lighter and has a distinctly honey yellow appearance. Hind wing and cilia greyish cream buff. Abdomen and legs cream buff.

Male genitalia (Text-fig. 4): Valva with apex curved ventrad and with tip sharply pointed and slightly more sclerotized. Uncus flattened, triangular in outline, gnathus arms broad laterally, fused medially and abruptly tapered with point downturned. Transtilla a narrow weakly sclerotized band. Vinculum evenly rounded, no saccus. Aedoeagus long and curved, rather stout at middle, attenuated at ends, a very long internal cornutus, base of aedoeagus weakly sclerotized on one side and coiled.

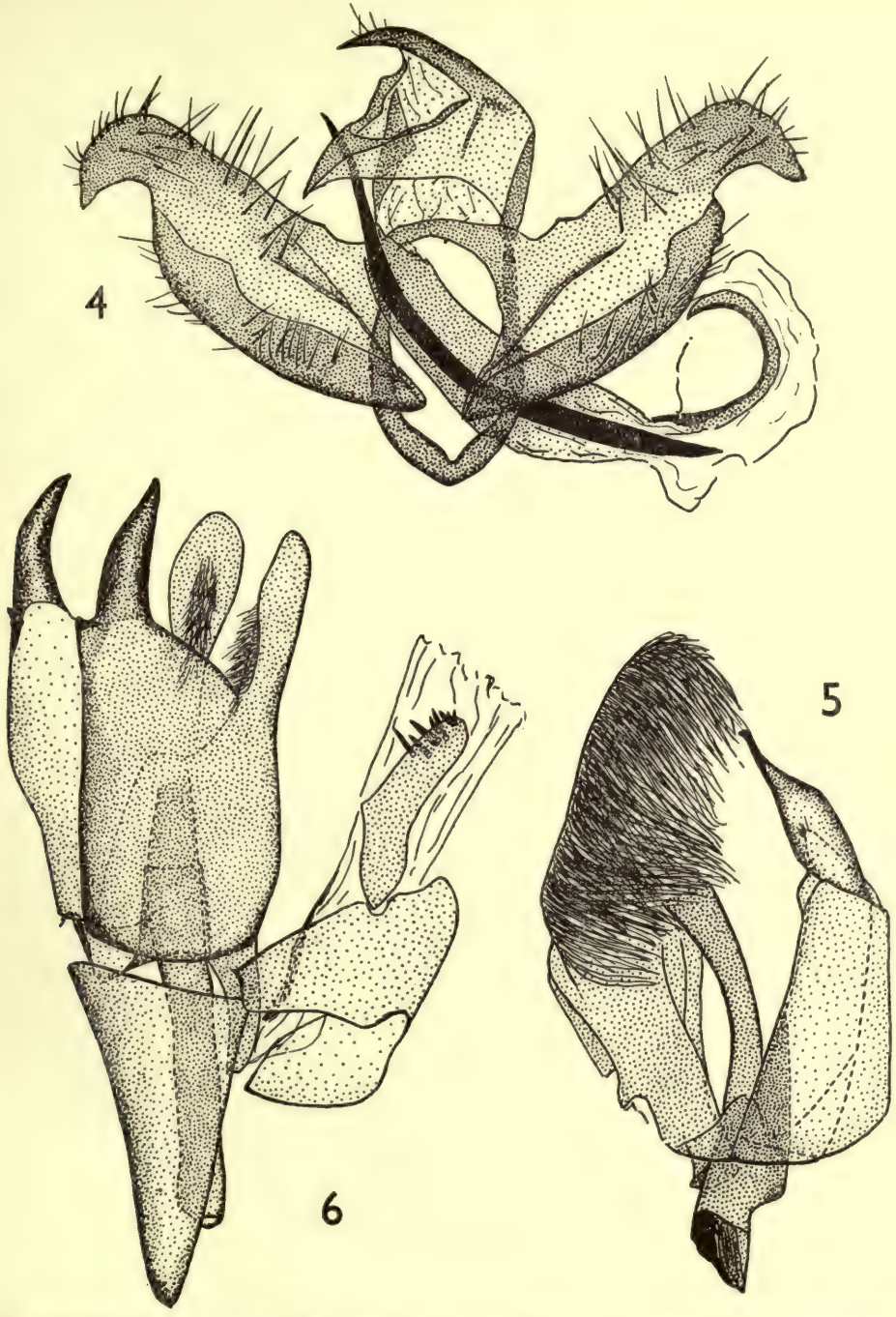
Type ♂: " Lord Howe Island, Mt. Lidgbird, 19.viii.1953". Genitalia slide B.M.3774. Paratypes: 2 ♂, same data as type. All examples caught flying within the shelter of a cave-like overhang frequented by goats.

This species is near to *E. adocina* Turner, which is a slightly larger species occurring in Queensland.

Cosmopterygidae

Pyroderces anoista sp. n.

♂ 11 mm. Labial palpus shining cream-buff, basal segment fuscous exteriorly, second segment narrowly ringed with fuscous apically and with a rather indistinct



FIGS. 4–6.—Male genitalia. (4) *Elaeonoma aneusema* sp. n., ventral view. (5) *Pyroderces anoista* sp. n., lateral view. (6) *Opogona euchaetes* sp. n., lateral view.

fuscous supramedial annulus, terminal segment broadly marked with dark fuscous on underside at middle and before apex. Head with frons shining cartridge-buff, vertex, thorax and tegula dark cream-buff, tegula flecked with brownish. Antenna whitish, annulate with dark fuscous, scape cream-buff overlaid with brownish. Fore wing cream-buff, a large pale reddish fawn marking at base edged outwardly with a thin black line, outwardly oblique from about 1/6 of costa, straight to beyond middle then curving dorsad, followed by a slight sprinkling of black scales, a small reddish fawn patch on costa at about 1/3, a mixture of blackish and ochreous scales before apex, dorsum irregularly suffused with reddish fawn, a small wedge-shaped oblique reddish fawn marking from dorsum at 1/3 to about middle with a few black scales each side at the tip, an elongate longitudinal dash of reddish fawn in discal area confluent with a flattened ring of sparse black scales above, a heavy blackish streak at apex. Cilia greyish. Hind wing grey, cilia greyish. Legs cartridge-buff, heavily ringed with fuscous-black or dark mummy brown. Abdomen greyish fuscous above, shining cartridge-buff beneath, a small cartridge buff anal tuft.

Male genitalia (Text-fig. 5) : Valva elongate, densely haired on inner side, apex evenly rounded. Gnathus with left half large, weakly sclerotized, tapered from middle to apex ; right half small. Aedoeagus semimembranous, curved, widening at apex.

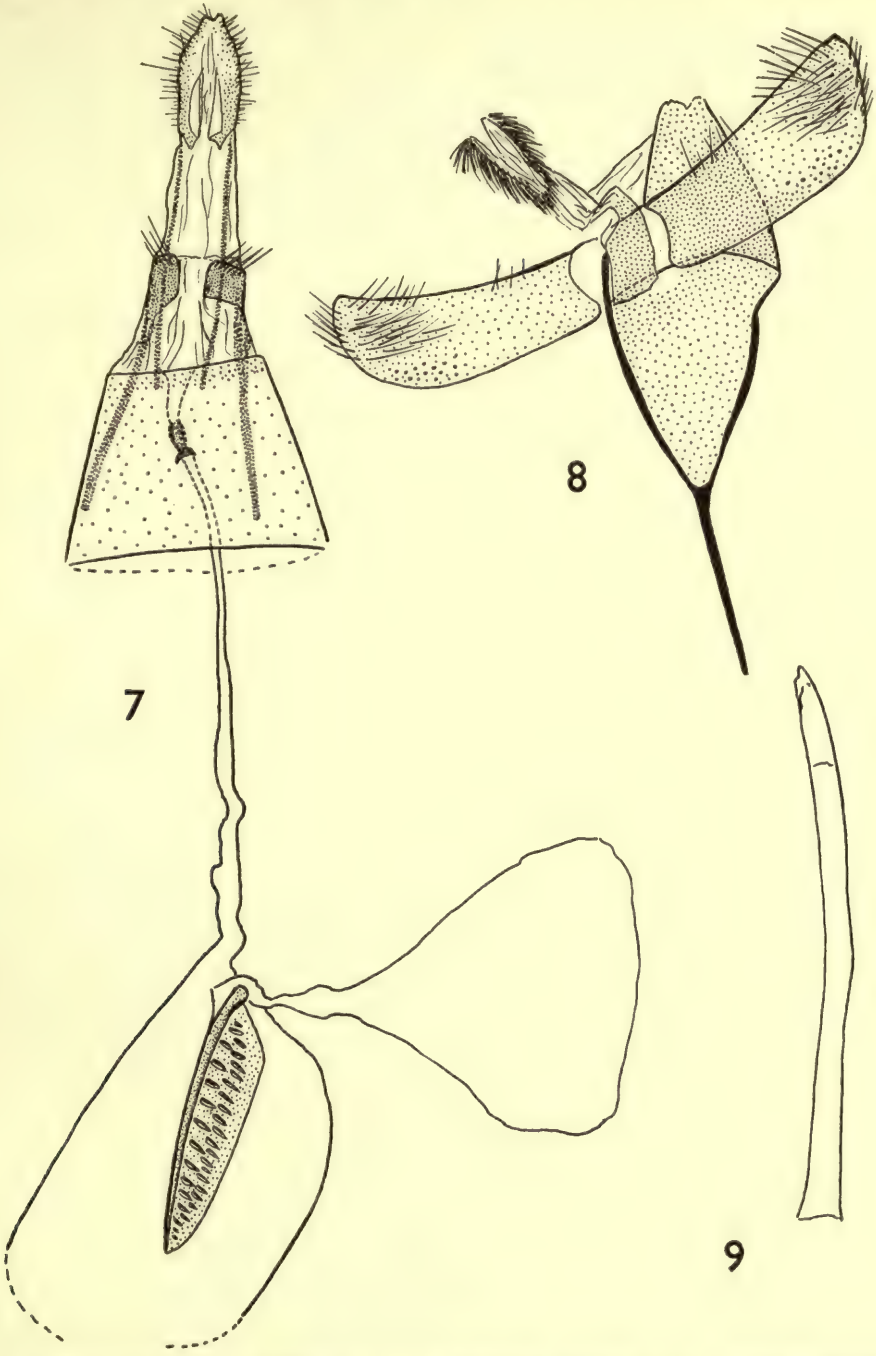
Type ♂ : " Lord Howe Island, Mt. Lidgbird, 19.viii.1953 ". Genitalia slide B.M.3700. Paratype : 1 ♂, same data as type. Both examples caught among palms.

Allied to the Western Australian species *P. terminella* (Walker), but may be distinguished by the curved outer edge of the basal marking on the fore wing.

Batrachedra eurema sp. n.

♀ 16 mm. Labial palpus cream-buff, second segment with two broad fuscous annuli narrowly separated at the middle and the second nearly reaching the apex, terminal segment dark fuscous on inner side and with outer side obliquely fuscous from middle to apex and with a narrow fuscous sub-basal bar. Head with frons cream-buff, a cream-buff area around eyes, vertex thickly clothed with loosely appressed, faintly iridescent, dark fuscous scales. Thorax and tegula cream-buff mixed with light fuscous. Fore wing extremely narrow, long and acutely pointed, ground colour cream-buff, costal area suffused with dark mummy brown, a broad dark mummy brown streak, faintly iridescent, along dorsum to beyond tornus thence gradually narrowing along termen to apex, plical stigma consisting of a small elongate black dash at 1/4 with lower edge touching dorsal streak, a narrow medial streak of ground colour lightly peppered with minute specks of fuscous. Cilia grey. Hind wing light grey, cilia greyish. Legs cream-buff irrorate exteriorly with fuscous. Abdomen fuscous above, cartridge buff below.

Female genitalia (Text-fig. 7) : Ovipositor fairly broad, moderately setose. Ostium anterior, membranous. Ostial plate divided medially, caudal margins of the two halves rounded, well furnished with fine long setae. Ductus bursae narrow. Bursa copulatrix with a large signum in the form of a heavily sclerotized elongate plate



FIGS. 7–9.—Male and female genitalia. (7) *Batrachedra eurema* sp. n., female, ventral view. (8) *Decadarchis leucocyma* sp. n., male, ventral view. (9) *D. leucocyma* sp. n., aedoeagus, lateral view.

bearing uneven rows of teeth-like projections. Inception of ductus seminalis at entrance to bursa near signum.

Type ♀: " Lord Howe Island, Mt. Lidgbird, 19.viii.1953 ". Genitalia slide B.M.3727. One example only, caught among *Howea* palms.

This species is superficially similar to *B. epombra* Meyrick from South Africa and *B. macroloncha* Meyrick from Ceylon, but may be recognized by the distinct medial ground colour stripe on the fore wing.

Glyphipteryigidae

Simaethis sycopola Meyrick

Simaethis sycopola Meyrick, 1880, Proc. Linnean Soc. N.S. Wales, **5** : 211.

A male example caught flying actively in sunshine on the lower slopes of Mt. Lidgbird, " Lord Howe Island, 19.viii.1953 ". Genitalia slide B.M.3775.

An Australian species occurring in Queensland and New South Wales. The larva feeds on the leaves of *Ficus stipulata* according to Meyrick (loc. cit.) and on other species of *Ficus* (*Vide* Tillyard, 1926, *Insects of Australia and New Zealand*, p. 423).

Elachistidae

Elachista archaeonoma Meyrick

Elachista archaeonoma Meyrick, 1888, Trans. Proc. New Zealand Inst., **21** : 179.
Elachista synethes Meyrick, 1897, Proc. Linnean Soc. N.S. Wales, **22** : 333. **syn. nov.**

A common species in grassy places on Lord Howe Island. Five moths were caught flying very low amongst grass by the lagoon and others were seen, " 18.viii.1953 ". Two more were caught on a grassy patch on Mt. Lidgbird, " 19.viii.1953 ".

This species is recorded from Auckland, Nelson, Wellington and Dunedin in New Zealand (Meyrick, 1888, l.c.), and New South Wales, Melbourne and W. Australia (Meyrick, 1897, l.c.). It is doubtfully recorded from Norfolk Island in a collection made by Mrs. I. McComish (Hawkins, 1942, *Ann. Mag. nat. Hist.* ser. 11, **9** : 874).

The new synonymy above has been introduced after examination of the syntypes from Meyrick's collection in the British Museum (Natural History).

Gracillariidae

Acrocercops tomia sp. n.

♂ 8 mm. Labial palpus white, second segment suffused with fuscous exteriorly towards apex. Head and thorax white. Tegula white with an admixture of cream-buff anteriorly. Antenna dark fuscous. Fore wing narrowly elongate-lanceolate, light ochraceous-tawny, three transverse white markings edged with black, one at 1/3, the second at middle identical with the first and separated from it by an area of ground colour of much the same size, the third marking at 3/4 as broad on dorsum as the first two markings but narrower at costa, a much smaller white marking edged

with black scales from just before apex to tornus. Cilia greyish. Hind wing dark grey. Legs white with light ochraceous-tawny annuli.

Male genitalia (Text-fig. 3) : Valva semi-membranous, very broad at base, costa weakly sclerotized, an invagination containing specialized scales at the middle of the exterior ventral margin. Transtilla narrow. Aedoeagus weakly sclerotized, slightly stouter apically.

Type ♂ : " Lord Howe Island, 18.viii.1953 ". Genitalia slide B.M.3783.

Superficially almost identical with the Eastern Australian species *A. antigrapha* Turner, from which it is separated by slight comparative differences in the male genitalia, having the valva more tapered apically, and the pocket in the ventral margin containing specialized scales rounded and not elongate as in *antigrapha*.

Lyonetiidae

Opogona euchaetes sp. n.

♂ 16 mm. Labial palpus dark mummy brown exteriorly, shining greyish cream-buff interiorly. Front of head dark fuscous, fringe between antennae shining cream-buff with an admixture of fuscous basally, vertex, thorax and tegula dark fuscous, tegula slightly darker. Antenna cartridge buff suffused with dark fuscous basally, scape fuscous-black. Fore wing dark fuscous, basal half thickly overlaid with very small, narrow dark olive-buff scales, which give this part of the wing a matt appearance. Cilia pale ochreous. Hindwing pellucid at base, apex shining golden ochreous, middle of wing fuscous-black, a specialized area at base of costa bearing long, greyish cream-buff hairs. Cilia pale ochreous. Legs pale ochreous. Abdomen light fuscous.

Male genitalia (Text-fig. 6) : Valva with costa free, rounded at apex, sacculus strongly sclerotized, produced distally to a stout prong with sharp points. Vinculum triangular, without saccus. Gnathus arms small, elongate and bearing a few heavy spine-like setae on inner side. Aedoeagus stout, cylindrical.

Type ♂ : " Lord Howe Island, Mt. Lidgbird, 19.viii.1953 ". Genitalia slide B.M.3771.

In size and superficial appearance this species resembles *O. omoscopa* (Meyrick), but the matt effect given to the basal part of the fore wing of the male by the small dark olive-buff scales makes it distinctive.

Decadarchis leucocyma sp. n.

♂ 12 mm. Labial palpus honey yellow, second segment and basal half of terminal segment suffused with fuscous exteriorly. Frons cartridge buff mixed with dark mummy brown and fuscous, vertex and thorax dark mummy brown mixed with fuscous. Antenna cartridge buff, thickened at middle, scape brownish. Fore wing (rubbed) narrow, elongate-lanceolate, greyish ochreous with diffuse brownish or dark fuscous markings and scattered brownish scales, a brownish marking at base, another on dorsum beyond middle, five or six outwardly oblique, thin, short white stripes from costa, first at middle, last just before apex, both very short, spaces

between stripes dark mummy brown, apex dark mummy brown. Cilia dark cream-buff. Hind wing light grey, cilia cream-buff. Legs cream-buff.

Male genitalia (Text-figs. 8 and 9) : Valva weakly sclerotized. Tegumen short, rounded, narrowing caudad. Uncus not developed. Gnathus fringed with strong setae laterally. Saccus very long and thin.

Type ♂: "Lord Howe Island, Mt. Lidgbird, 19.viii.1953". Genitalia slide B.M.3782.

This species has been provisionally placed in the genus *Decadarchis* Meyrick near *D. subridens* Meyrick, a Fijian species, which it superficially resembles.

II. NORFOLK ISLAND

Norfolk Island is one of the small isolated islands in the South Pacific at which we called on the voyage from Australia to the Solomons. We were fortunate enough to have an opportunity of spending a morning ashore while cargo was being unloaded.

We landed at Cascades, a rocky and uninhabited section of the coast on the opposite side of the island to Kingston. The regular landing place at Kingston was unusable due to a heavy swell. Hills and valleys wooded with the Norfolk Island pine, *Araucaria excelsa*, lie behind the cliffs at Cascades, forming a landscape which in some respects is reminiscent of parts of the North Downs in England. The present paper is based on material collected in this woodland.

For a small collection comprising forty-one specimens secured in rather hurried circumstances it has proved much more interesting than could be expected, and it is evident that much has yet to be learnt about the lepidopterous fauna of Norfolk Island. The material represents eight species, including five which are apparently new to science, one of which belongs to an apparently undescribed genus. Of the previously known species, two are endemic to Norfolk Island and are extremely rare in collections. A new genus is now described for one of them, *Tinea capnitis* Turner and attention is drawn to certain morphological differences in the other species, *Schoenotenes capnosema* Turner, which may possibly be of generic significance. The third known species is *Opogona omoscopa* (Meyrick), which, although it belongs to a genus well represented in the Indo-Australian region, is nevertheless characteristic of South Africa and the Madeiras and has undoubtedly been introduced to Norfolk Island by shipping.

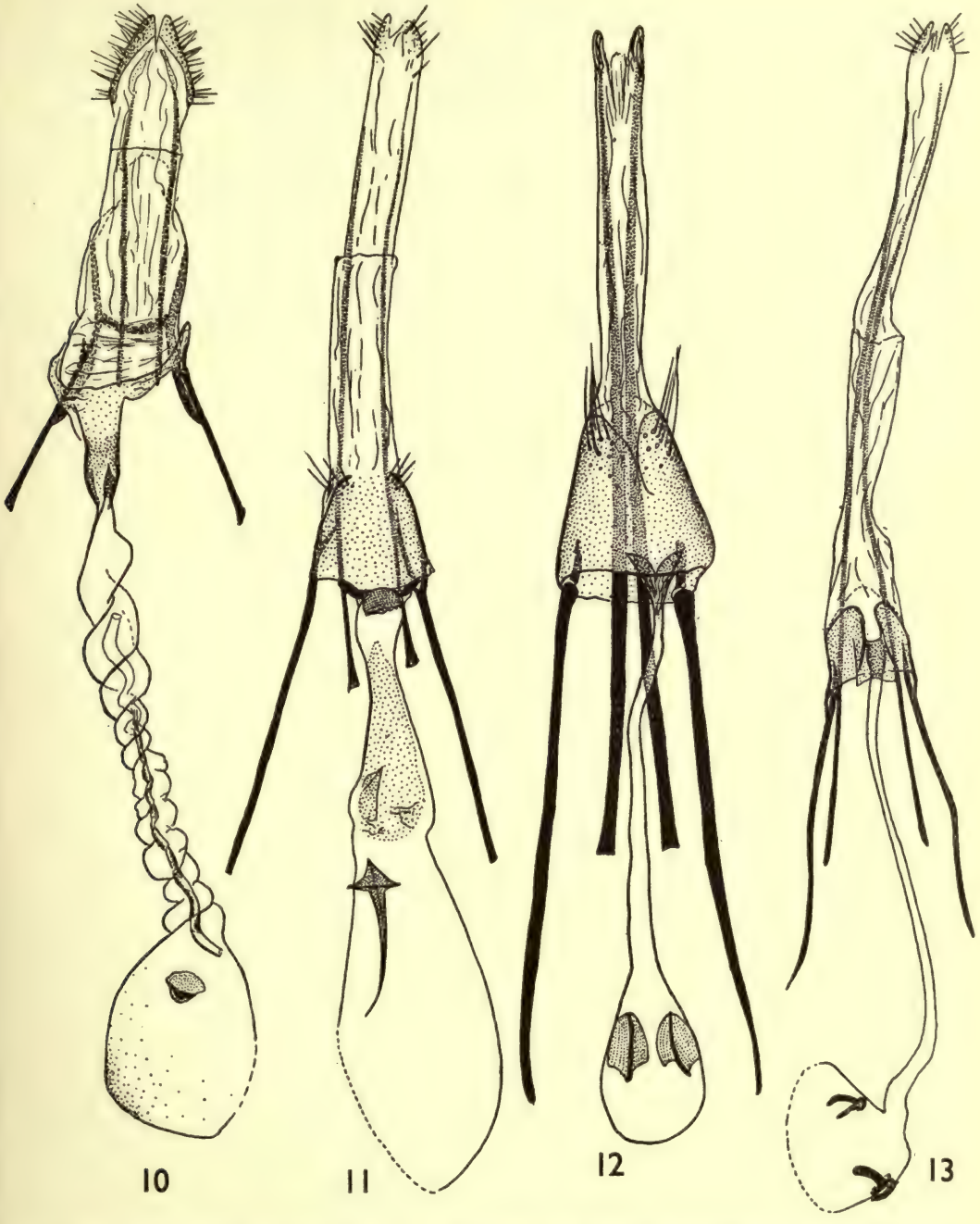
The collection is in the British Museum (Natural History), including the types and paratypes of the species described below. When making the descriptions, colour terms have in most instances been taken from Ridgway's *Color Standards and Color Nomenclature.*

SCHOENOTENIDAE

Schoenotenes capnosema Turner

Schoenotenes capnosema Turner, 1918, Trans. roy. Soc. S. Aust., **42** : 287.

One female example of this species was captured among dead, fallen branches of *Araucaria excelsa*, "Cascades, Norfolk Island, 26.viii.1953". Genitalia slide B.M.3691.



FIGS. 10–13.—Female genitalia. (10) *Schoenotenes capnosema* Turner. (11) *Comodica semiades* sp. n. (12) *Norfolkia hilderi* gen. n. sp. n. (13) *Opogona psola* sp. n.

This appears to be an aberrant species of *Schoenotenes*. In the fore wing vein 2 is more strongly curved at the base than is normal in the genus, the parting vein is represented by a fold only, and in the hind wing the stalking of veins 6 and 7 is longer than is usual and vein 7 goes to the costa and not to the apex as in the other known species. The female genitalia also appear to be somewhat atypical of the genus.

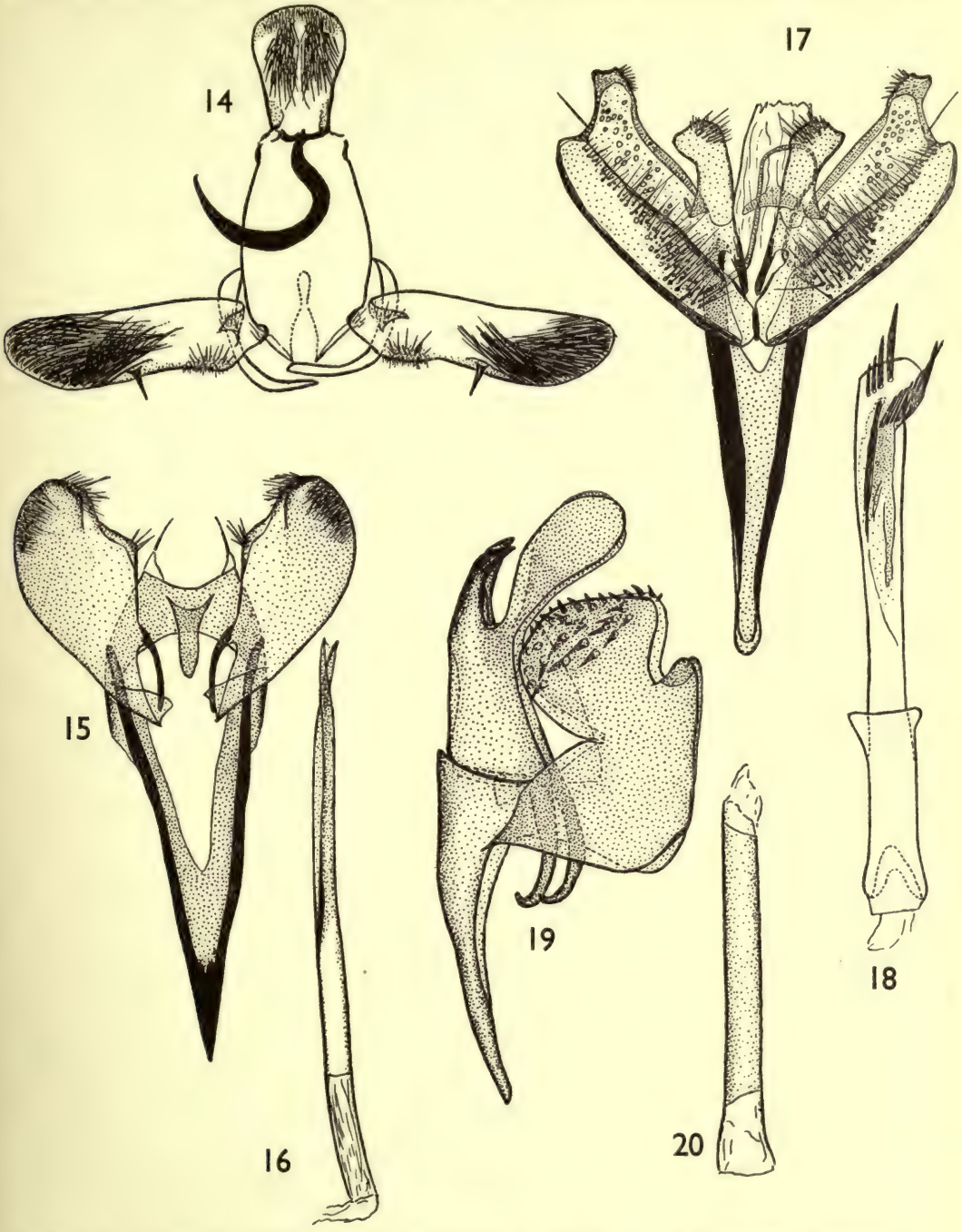
The venational and genitalic differences evident in the female of *capnosema* may indicate generic or subgeneric distinctness, but a proper evaluation of these characters must remain in abeyance until examples of the male can be obtained for study.

Female genitalia (Text-fig. 10) : These have not previously been described or figured for this species. Ovipositor extensile, when fully extended the ends of the posterior apophyses are level with the ostium, lobes narrow, pointed and with apices close together, sparsely clothed with fine setae laterally. Anterior apophyses reaching to inception of ductus seminalis, connected to each other basally by a narrow strongly sclerotized transverse dorsal band. Ostium membranous, wide at mouth becoming a cylindrical tube weakly sclerotized as it narrows to enter ductus bursae, which is fairly long and narrow and is convoluted throughout its length and has an internal coiled cestum. Ductus bursae subspherical, signum small and tooth-like.

Gelechiidae

Anisoplaca cosmia sp. n.

♂ 16 mm. Labial palpus light cartridge buff above, warm buff below, basal segment and underside of second segment except apex overlaid with fuscous black, upperside of second segment with fuscous medial band, third segment lightly overlaid with light fuscous at base of underside and with a narrow fuscous supramedial band. Head, thorax (thorax rubbed), patagia and tegula cartridge buff, individual scales on head brownish at tips, patagia dark brown basally. Antenna cream-buff, finely ciliated along anterior margin, posterior margin with segment barred with fuscous basally ; scape cartridge buff minutely irrorated with brownish, bearing a pecten of several long fuscous hair-like scales. Fore wing cartridge buff with diffused fuscous-black markings ; anterior margin of costa irrorated with blackish, a blackish dash at 4/5 and a small black spot at base, an ochreous-buff suffusion below costa from near base to apex, four small black discal dot-like spots surrounded by whitish rings, first in disc before middle, second on fold rather before first, their rings confluent, third and fourth transversely placed and close together at 3/5, their rings confluent, a fifth spot not surrounded by a whitish ring immediately above the first discal in the ochreous-buff suffusion below costa, a cloudy whitish subterminal fascia from 4/5 of costa to tornus, dentate outwards in middle to termen, edged inwardly with fuscous, a heavy blackish dash at about middle touching the whitish rings of the outer discal spots and a large fuscous pretornal blotch on dorsum, a cloudy blackish terminal line. Cilia whitish along termen with a diffuse fuscous basal line, mixed with fuscous black around apex, wholly light fuscous on dorsum. Hind wing light grey, a long pale cartridge buff hair-pencil from base of inner margin. Cilia light cartridge buff, a



FIGS. 14–20.—Male genitalia. (14) *Anisoplaca cosmia* sp. n. (15) *Erechthias strigata* sp. n. (16) *E. strigata* sp. n., aedoeagus. (17) *Comodica semiades* sp. n. (18) *C. semiades* sp. n., aedoeagus. (19) *Opogona psola* sp. n. (20) *O. psola* sp. n., aedoeagus.

greyish sub-basal line. Legs cream-buff, fore- and middle legs with wide fuscous annuli, hind leg irrorated with fuscous on underside.

Male genitalia (Text-figs. 14 and 21): Valva elongate, narrow, apex rounded, distal margin clothed with fine setae on innerside. Sacculus weak, a solitary strong spine-like seta projecting from inner margin. Uncus spatulate, broadly rounded apically, two parallel longitudinal rows of long setae on inner face. Gnathus arms very short, supporting a very large and heavily sclerotized hook. Aedoeagus with basal portion stout and somewhat bulbous, apical half constricted, widening slightly at apex and with a minute thorn-like projection at right angles to tip.

Type ♂: "Norfolk Island, Cascades, 26.viii.1953". One example only, caught at rest on the bole of *Araucaria excelsa*. Genitalia slide B.M.3787.

This species is very closely allied to the New Zealand species *A. archyrota* Meyrick. The markings and coloration of the fore wings of the two species are very similar, but they can be distinguished by the labial palpus, which in *cosmia* is fuscous-black to the apex on the underside of the second segment, while in *archyrota* only the basal two-thirds are fuscous-black. In *archyrota* the basal half of the valva of the male genitalia is very narrow and there is a triangular projection on the ventral margin beyond the middle which bears a small sclerotized point at the apex.

Lyonetiidae

Erechthias strigata sp. n.

♂ 10 mm. Labial palpus light cartridge buff, second and terminal segments dark fuscous outwardly, a small apical tuft of raised scales on underside of second segment. Head, thorax, tegula and antenna light cartridge buff, an admixture of fuscous at middle and anterior margin of thorax and on tegula. Fore wing whitish cartridge buff, base of costa heavily suffused with fuscous, a thin sprinkling of fuscous scales from near base across middle of wing merging at 2/3 with a large distinctive patch of blackish fuscous which extends transversely from immediately below costa to a little beyond middle, the upper (costal) edge of the patch is outwardly oblique and is parallel with three narrow apical stripes, the outer one being the broadest and at the apex, the first stripe is separated from the blackish fuscous patch by a thin white line and a similar line separates the second and third stripes, a somewhat wider gap of ochreous-buff separates the first and second stripes, below the stripes a thin whitish line extends from the middle of the discal patch to the apex, a heavy fuscous-black dash from lower (dorsal) edge of discal patch to middle of termen, a few ochreous-buff scales at tornus. Cilia whitish, a small patch of ochreous-buff in the indentation below apex, cilia above apex tipped with fuscous. Hind wing light cartridge buff, a small fuscous dash at apex. Cilia light cartridge buff. Legs cartridge buff, fore leg blackish fuscous anteriorly, tibia of hind leg clothed with fine cream-buff hair.

Male genitalia (Text-figs. 15 and 16): Valva short, rounded distally, costa and distal margin clothed with fine hair, a close-set cluster of four setae at base of costa. Vinculum very long, narrow and with straight sides. Saccus short. Aedoeagus

cylindrical, long and straight, tip slender and pointed. Vesica with a sclerotized strand.

Type ♂: "Norfolk Island, Cascades, 26.viii.1953". Genitalia slide B.M.3827. Paratypes: 2 ♂, same data as type. Genitalia slide B.M.3785. All examples found in the crevices of the bark of *Araucaria excelsa*.

This species is recognizable by the blackish discal marking on the fore wing; it may be placed near the tropicopolitan species *E. zebrina* (Butler).

Comodica semiades sp. n.

♂, ♀ 10–11 mm. Labial palpus whitish cartridge buff, narrowly fuscous-black exteriorly to near apex, a few scattered dark fuscous bristles exteriorly on second segment. Head cartridge buff, sometimes an admixture of fuscous between antennae and on vertex. Thorax and tegula cartridge buff, female with a small fuscous spot in middle of thorax and a similar spot each side of the medial line in the anterior margin of thorax. Antenna greyish, scape cartridge buff with a longitudinal fuscous line anteriorly; male with a deep notch at base. Fore wing cartridge buff or warm buff, irregularly suffused with ochreous buff and with dark brown and fuscous-black markings; the sexes are slightly dimorphic and the female is usually of darker coloration and is more heavily marked than the male; five outwardly oblique fuscous-black or dark brown streaks from costa, in the male the first or basal of these streaks is very weak or absent, a similar outwardly oblique streak from middle of dorsum weak in the male and strong in the female, anterior edge of costa fuscous-black at base, in the male the whole of the basal half of the wing excepting the costa is usually a unicolorous cartridge buff or warm buff without markings, while in the female it is irregularly marked with dark brown or fuscous-black streaks, in both sexes the fourth costal streak is wedge-shaped and is followed by a short line of silvery scales to middle where it meets at right-angles a heavy black dash which extends towards termen and is surrounded outwardly by a wide area of dark ochreous buff, a broad suffusion of dark ochreous buff extends inwards from the line of silvery scales nearly to middle, in the female the basal and second costal streaks extend across this and together with the streak from middle of dorsum converge a little below (dorsad) the silvery line and are followed by a small patch of white scales, termen suffused with fuscous sometimes with a faint purplish iridescence, a small black spot below apex. Cilia greyish cartridge buff, two straight lines of fuscous-black projecting from apex, the upper one rather obliquely upwards and the lower one obliquely downwards, beneath the latter the cilia are excavated by a curved wedge-shaped indentation. Hind wing greyish. Cilia greyish cartridge buff, whitish basally, a thin black line projecting from apex.

Male genitalia (Text-figs. 17 and 18): Valva elongate, distal margin excavate, apex somewhat produced, obtuse, slightly thickened and indented ventrally, a short arm-like process (? costa) arising from base of valva, knobbed at the end and clothed with a few spine-like setae. Aedoeagus straight, cylindrical. Vesica armed with rows or clusters of straight, thorn-like cornuti.

Female genitalia (Text-fig. 11) : Ovipositor long, extensile, lobes slightly dilated, obtuse, setose. Ostial plate hardly sclerotized, elongate, a few fine setae on caudal margin laterally. Ostium rounded, situated on anterior margin, with lateral slightly raised oblique sclerotized ridges. Ductus bursae short, widening and soon entering bursa copulatrix which is elongate and bears a cross-shaped signum.

Type ♂: " Norfolk Island, Cascades, 26.viii.53 ". Genitalia slide B.M.3780. Paratypes: 5 ♂, 9 ♀, same data as type. Genitalia slides B.M.3745, B.M.3746 and B.M.3793. All examples caught on the dead wood of a fallen *Araucaria excelsa*.

The peculiar streaked and variegated ornamentation of this species, particularly of the female, likens it superficially to the Australian species *C. tetracercella* Meyrick, which is recognizable by the four or five oblique fuscous stripes on the dorsum of the fore wing.

Opogona omoscopa (Meyrick)

Hieroxestis omoscopa Meyrick, 1893, Proc. Linnean Soc. N.S.Wales, **17** : 567.

One male example captured among fallen branches and litter beneath *Araucaria excelsa*, " Norfolk Island, Casacades, 26.viii.1953 ".

This species has a wide distribution and is known from South Africa, Madeiras, Rodriguez, Mauritius, East Australia, New Zealand and Lord Howe Island. It belongs to a group characteristic of South Africa and the Madeiras. The habit of the larva of feeding in dead stems of sugarcane and other plants and, according to Meyrick (loc. cit.) on cork, has no doubt led to its importation to Norfolk Island.

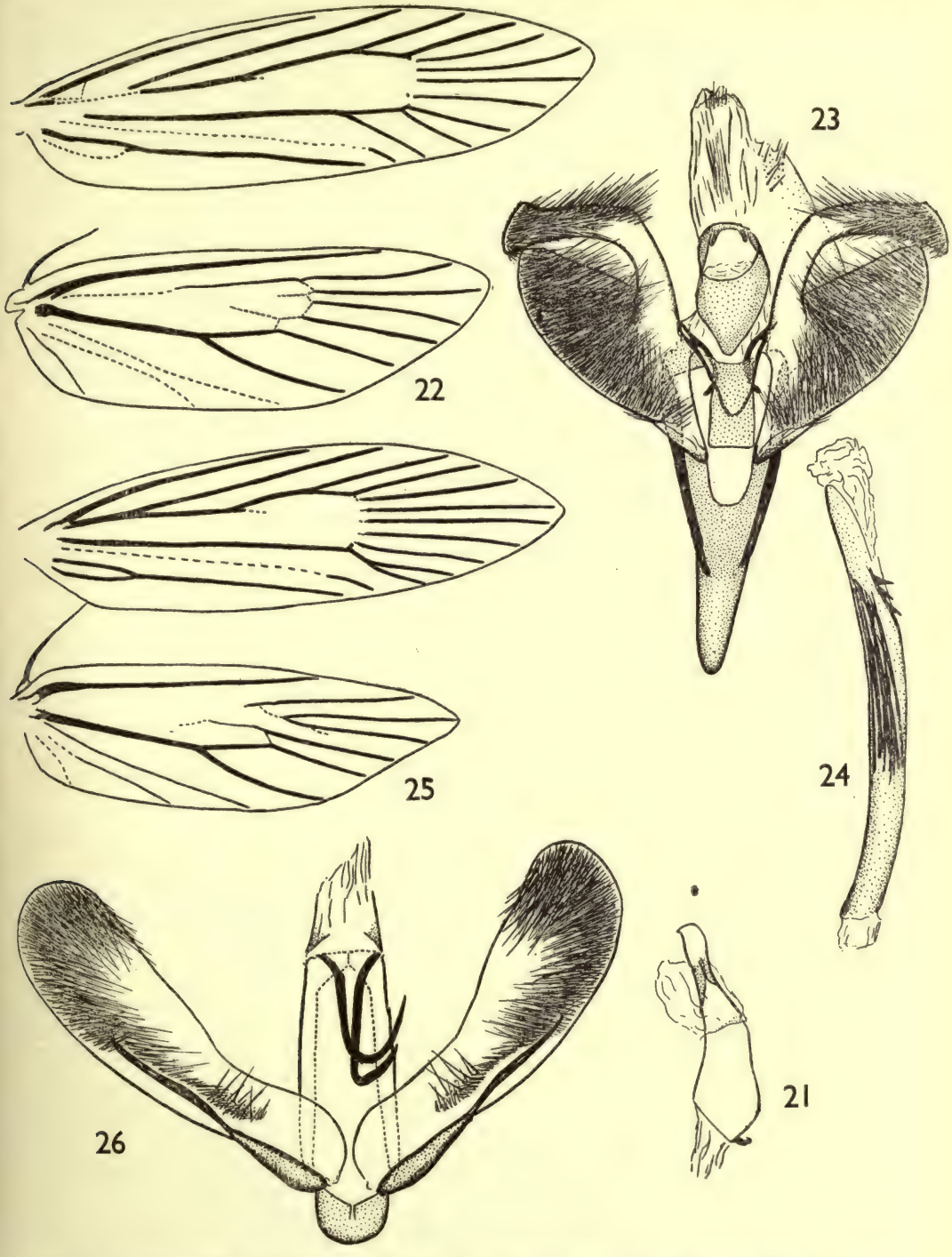
Opogona psola sp. n.

♂, ♀ 9–12 mm. Labial and maxillary palpi, front of head and antenna ivory yellow, labial palpus dark brown exteriorly, frons smooth and shining, vertex, thorax and antennal scape olive-brown. Fore wing olive-brown with a slight bronzy sheen. Cilia buffy brown. Hind wing shining brassy grey, a very slight trace of iridescence along costa and dorsum extending into cilia. Cilia light buffy brown. Legs ochreous, innerside of fore leg dark olive-brown. Abdomen greyish ochreous above, whitish ochreous beneath.

Male genitalia (Text-figs. 19 and 20) : Valva long and narrow, apical half somewhat paddle-shaped. Sacculus strong, narrow, distal half free, sharply pointed. Saccus moderate, tapering to a point. Tegumen rounded, anterior margin deeply cleft. Uncus bifid, a pair of vestigial rounded lobes. Gnathus a pair of subquadrate lobes, innerside of distal area studded with heavy setae. Aedoeagus cylindrical, apex obliquely pointed.

Female genitalia (Text-fig. 13) : Ovipositor very long, extensile, lobes slightly dilated, setose at apices. Ostial plate weakly sclerotized, caudal margin deeply incised, forming a narrow groove to ostium, which is a small rounded opening situated in middle of plate. Ductus bursae moderately long, membraneous and narrow. Bursa copulatrix subspherical, two stout thorn-like signa.

Type ♂: " Norfolk Island, Cascades, 26.viii.53 ". Genitalia slide B.M.3822.



FIGS. 21–26.—(21) *Anisoplaca cosmia* sp. n., aedoeagus. (22) *Empaesta* gen. n., wing venation. (23) *Empaesta capnitis* (Turner) comb. n., male genitalia, (24) *E. capnitis* (Turner) comb. n., aedoeagus. (25) *Norfolkia* gen. n., wing venation. (26) *Norfolkia hilderi* gen. n. sp. n., male genitalia.

Paratypes: 13 ♂ and ♀, same data as type. Genitalia slides B.M.3729 and B.M.3788. All the above examples were collected from the thick carpet of dead twigs and branches beneath the *Araucaria excelsa*.

This species is closely allied and superficially similar to the Hawaiian species *O. aurisquamosa* Butler, which is slightly larger, and has an extremely long saccus in the male genitalia.

Tineidae

NORFOLKIA gen. n.

Labial palpus porrect, extending well beyond head, terminal segment as long as or longer than second, second segment roughened beneath and with apical bristles, terminal segment complanate, grooved beneath. Maxillary palpus not folded. Tongue short. Antenna filiform in both sexes. Head with scales appressed. Fore wing (Text-fig. 25) elongate-ovate, pointed, all veins present, 1b furcate, 2 and 3 stalked from angle, 7 to costa near apex, indication of parting vein in cell. Hind wing (Text-fig. 25) trapezoidal, pointed, all veins present, 2 from well before 3, 3 and 4 separate, 4 and 5 parallel, 5 and 6 connate or short stalked, 6 to apex.

Male genitalia (Text-fig. 26): Tegumen elongate, uncus membranous. Gnathus paired. Valva simple, sacculus weakly developed. Vinculum rounded, without saccus. Aedoeagus cylindrical.

Female genitalia (Text-fig. 12): Ovipositor moderately strong, extensile, lobes poorly developed. Ostial plate moderately sclerotized, tapered caudally. Ostium external, small, membranous. Bursa copulatrix with double signum. Apophyses very strong.

Type species: *Norfolkia hilderi* sp. n.

A genus apparently endemic to Norfolk Island. Near to *Tinea*, but distinguished by the lack of a saccus in the male genitalia.

Norfolkia hilderi sp. n.

♂ 14 mm., ♀ 16 mm. Upperside of labial palpus cartridge buff, apex of third segment lightly tipped with ochreous buff; underside ochreous-buff, terminal segment heavily irrorated with fuscous-black; second segment with several dark brown apical bristles laterally. Lower part of frons cartridge buff, upper part and vertex ochreous-buff irrorated with dark brown. Thorax and base of tegula dark mummy brown, tip of tegula cream buff irrorated with brown. Antenna cream buff, antennal segments annulate basally with dark brown, scape ochreous-buff, brown at base anteriorly. Fore wing cream-buff irrorated with mummy brown, markings dark mummy brown lightly sprinkled with ochreous-buff, a broad elongate somewhat diffuse marking at base of costa having outer margin strongly emphasized and reaching to plical fold where it converges with the inner corner of a heavy quadrate marking on dorsum at 1/3, a transverse marking on costa at 1/3 reaching to middle, a much smaller marking on costa a little beyond 1/2 and a similar pretornal marking opposite on

dorsum, an inwardly oblique variable dark mummy brown preapical fascia conspicuous on costa becoming diffuse and indistinct towards middle and very weak or disappearing towards tornus, some small dots and flecks of brown along costa interspersed between the larger markings, termen mummy brown or mummy brown mixed with dark ochreous-buff. Cilia cartridge buff mixed with brown. Hind wing thinly scaled basally, dark grey with a purplish iridescence distally. Cilia greyish cartridge buff. Legs cream-buff with coloration lighter proximally; fore leg with distinct fuscous-black annuli; middle leg femur lightly overlaid with fuscous on underside, tibia fuscous-black to near apex, tarsus with broad fuscous-black annula; hind leg with tibia and spurs outwardly suffused with dark fuscous, tarsus with broad dark fuscous annuli. Abdomen dark fuscous above and at sides, cream-buff below; male with a small dark fuscous anal tuft.

Male genitalia (Text-fig. 26): Valva weakly sclerotized, slightly constricted and clothed with a few fine setae a little beyond base, apex rounded. Sacculus very narrow, thin and acutely pointed distally. Gnathus arms thin curved rods, acutely pointed. Vinculum evenly rounded. Aedoeagus a straight cylindrical tube, slightly broader at base, apex obliquely pointed.

Female genitalia (Text-fig. 12): Ovipositor lobes convoluted, weakly sclerotized. Ostial plate moderately sclerotized, broad anteriorly, tapering, caudal margin with a deep medial cleft, rounded laterally and furnished with a few scattered setae. Ostium situated on anterior margin of plate, very small and thinly membranous. Bursa copulatrix subspherical, small; signa shield-like with strongly sclerotized longitudinal keels. Posterior apophyses stout and very strongly sclerotized, extending to bursa.

Type ♂: "Norfolk Island, Cascades, 26.viii.53". Genitalia slide B.M.3784. Paratypes: 1 ♂, 1 ♀, same data as type. Genitalia slide B.M.3689. On the bark and rotten wood of a fallen *Araucaria excelsa*. A number of empty pupa cases were found which are believed to belong to this species.

Superficially this species is reminiscent of the palaearctic species *Nemapogon parasitella* (Hübner) but the structure of the male genitalia indicates a closer affinity to the genus *Tinea*.

I take pleasure in naming this interesting species after Captain Brett Hilder, who is well known in the islands of the South West Pacific.

EMPAESTA gen. n.

Labial palpus porrect, moderately long, about twice length of head, second segment about twice as long as third, roughened beneath, a longitudinal row of bristles laterally. Maxillary palpus long, folded. Tongue vestigial. Head wholly rough haired, thorax smooth. Antenna in male shortly ciliate, scape short and with a weak pecten. Ocellus absent. Hind tibia clothed with long hair posteriorly, a dense fringe of hair between the two pairs of spurs anteriorly. Fore wing (Text-fig. 22) all veins present, 1b strongly furcate, 1c present at margin only, veins arising from cell separate, 2 from

well before angle, 3 from angle, 4 approximate, 7 to costa, 11 from near base. Hind wing (Text-fig. 22) all veins present, separate, 7 to costa.

Male genitalia (Text-figs. 23 and 24) : Valva with an arm-like costal process arising from base. Tegumen weak, narrow. Uncus and gnathus vestigial, membranous. Anellus cylindrical. Vinculum long and narrow, produced to a moderate saccus. Aedoeagus tubular.

Type species : *Tinea capnitis* Turner, 1918, Trans. roy. Soc. S. Aust., **42** : 288.

The venational, palpal and other structural characters place this genus in the family Tineidae near the composite genus *Tinea*. The morphology of the male genitalia indicate affinities with the Lyonetiidae, and the present placing of the genus must therefore be considered as provisional until these two families become better known.

Empaesta capnitis (Turner), new combination.

Tinea capnitis Turner, loc. cit.

2 ♂: " Norfolk Island, Cascades, 26.viii.53 ". Genitalia slide B.M.3769. Both examples captured among *Araucaria excelsa*.

Male genitalia (Text-figs. 23 and 24) : Valva subtriangular, thickly clothed with fine hair on inner side, costal arm very strongly developed, elbowed, slightly broader and covered with fine hair at apex, truncate. Vinculum and saccus combined to form a continuous long narrow V-shaped structure. Aedoeagus with three external preapical teeth, a dense internal sheaf of long thin cornuti.

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JACQUES DE BEAUMONT

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ENTOMOLOGY Vol. 4 No. 5
LONDON: 1956

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PAR

JACQUES DE BEAUMONT

(Musée zoologique de Lausanne)

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SPHECIDAE (HYM.) RÉCOLTÉS EN LIBYE ET AU TIBESTI PAR M. KENNETH M. GUICHARD*

Par JACQUES DE BEAUMONT

M. KENNETH M. GUICHARD a séjourné longuement en Tripolitaine durant les années 1951–54 ; il a fait plusieurs expéditions dans diverses régions de le Libye et jusqu'au Tibesti. A côté de ses occupations acridologiques, il a eu l'excellente idée de récolter des Hyménoptères et je le remercie très vivement de m'avoir confié, par l'intermédiaire de MM. R. B. Benson et I. H. H. Yarrow, l'étude des Sphécides.

La liste des espèces de Sphecidae signalés en Libye jusqu'en 1932 a été donnée dans le " Prodromo della fauna della Libia " de Zavattari (1934). Les espèces capturées ultérieurement ont été notées par Guiglia (1942). En combinant ces deux travaux, l'on arrive à un total d'environ 125 espèces ; notons que les déterminations figurant dans les travaux anciens ne sont pas toutes dignes de foi et que certaines synonymies seraient à revoir. La plupart des espèces ont été citées de Cyrénaïque seulement ; c'est dire que les récoltes de M. Guichard, faites principalement en Tripolitaine et au Fezzan, sont un très important complément à la connaissance de la faune libyenne. Par ailleurs, nous n'avions pratiquement aucun renseignement sur les Hyménoptères du Tibesti.

La collection renferme plus de 800 spécimens. Ci-dessous, je signale 144 espèces ; 12 sont nouvelles ; 2 autres, également nouvelles, mais qui se trouvent aussi au Maroc, ont été décrites dans un autre travail ; il y a également une sous-espèce nouvelle et le ♂ ou la ♀ encore inconnus de plusieurs espèces. Quelques individus, appartenant en particulier aux genres *Astata*, *Tachysphex* et *Diodontus* ont été provisoirement laissés de côté ; ils appartiennent en partie à des espèces inédites.

Les localités de capture peuvent être groupées en 5 régions ; j'en donne ci-dessous la liste en indiquant les localités et les dates telles qu'elles figurent sur les étiquettes ; dans certains cas, une correction au nom donné ou une autre indication ont été ajoutées.

CYRÉNAÏQUE (Cy.)

Quelques récoltes seulement ont été faites, dans la partie côtière de la Cyrénaïque.

Cyrene, 23.iii, 29.iii, 3.iv.1954.
Tolmeta 2.iv.54.
Ras el Hilal 13.iv.54.
Derna 16 et 17.iv.54.
Wadi Mara 24.iv.54.
Barce (El Merg) 25.iv.54.
1 *km. east of Benghazi* 4.v.54.

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TRIPOLITAINE SEPTENTRIONALE (Tr.N.)

Certaines captures ont été faites dans la zone littorale :

Sabratha 23.xii.51, 27.ii, 14.iii.54.
Tripoli ii–iii.54.
Near Tripoli 1.vi.51.
Sidi Mesri i.52, 29.i.54.
Sidi Bennur 27.i.52, 8.iii.54.
Sidi Gelani 4.v.51.
Corradini 23.iv.51, 10.ii.53.
Ain Zara 28.v.51.
Azizia District 2.v.51.
Gargaresc, 7 km. W. of Tripoli v–vi.52.
Tagiura 10.vi.51.
Giar Garabulli 1.ii.52.
Cussabat 3.vi.51.
Homs 12.iii.52, 13.iii.54.
Leptis Magna 2.vi.51, 22 et 23 vi.52.
Zliten 11.iii.52.
Gioda 10.iii.52.

D'autres localités sont situées dans la chaîne côtière (Djebel Nefoussa).

Giado 23.vi.51.
Iefren (Jefren) 23.v.51, 24.ii.54.
Hills of Azizia-Garian Road 24.iii.51.
Garian 22.4, 23–24.vi.51, 22.ii.54.
Near Garian 2 et 6.v.51.
20 *km. W. of Garian* 6.v.51.
Bugheilan 6.vi.52.
Bir el Hamera, 50 km. S.W. of Mizda 20.v.51.

TRIPOLITAINE MERIDIONALE (Tr.S.)

Un certain nombre de localités, dans la région du Djebel Soda et du Djebel Harug el Asued one été visitées lors d'une expédition en ii et iii 1952.

Hon oasis 5 et 17.ii.52.
Meduin oasis 8.ii.52.
Zella oasis 9–10.ii.52.
El Harrug, Wadi el Majina 13.ii.52.
Jebel Soda 2.iii.52.
Jebel Soda, Wadi Ghodaifa 3.iii.52.
Hon 6.iii.52.
Wadi Touzist, 51 miles S. of Bou Ngem 8.iii.52.

FEZZAN (Fe.)

Mendib (Mendil) 85 miles S. E. of El Fogaha 24.ii.41.
In Aramas (W. de l'Edeyen de Mourzouk) 11.iv.–2.
Mourzouk 16.iv.52.
Oum el Aveneb (Oum el Araneb) 23.iv.52.
Traghen 28.iv.52.
El Manakh 50 m. N.W. of Edri 4.v.52.
Brak (*Brach*) 7 et 9.v.52, 11.xi.52.
Gatroun 2.ii.53.
Sebha 27.ii.53.

TIBESTI (Ti.)

Wadi Wour 7.iii.53.
Tao 8.iii.53.
Zouar 11.iii.53.
Zouar-Bardai Rd., 4,500 ft., 14.iii.53.
Bardai 18.iii.53.
Enneri Meché 21.iii.53.
Enneri Kudi 23.iii.53.
Bardai-Zouar Rd. 17.iii.53.
Zouarké 1.iv.53.
Guelta Morso 6.iv.53.
Dourzo 11.iv.53.

Quelles conclusions zoogéographiques peut-on tirer de l'étude de ce matériel? A la suite de bien des auteurs, j'ai indiqué, dans plusieurs travaux précédents, qu'il existe en Afrique du Nord deux régions biogéographiques ; la région méditerranéenne et la région saharienne. Au Maroc, en Algérie et en Tunisie, l'on n'a pas de difficultés à trouver la limite entre ces deux zones : il suffit de se reporter aux remarquables travaux des phytogéographes, qui l'ont tracée de façon précise. A ma connaissance, il n'existe pas, pour la Libye, de travaux de botanique faits sur les mêmes principes et qui pourraient servir de base.

Les problèmes de zoogéographie libyenne ont été traîtés par Zavattari (1934, 1938). Cet auteur divise le pays en une série de zones géographiques et climatiques, qu'il groupe également en 3 régions : côtière, présaharienne et saharienne. An allant de la côte vers l'intérieur, on voit la faune s'appauvrir et sa composition changer progressivement. Dans la région côtière (Cyrénaïque et Tripolitaine septentrionale de la liste ci-dessus), où alternent les aires de type européen-méditerranéen et prédésertique, on trouve un mélange d'espèces méditerranéennes et érémiennes, avec prédominance des premières ; dans la région présaharienne (Tripolitaine méridionale) on voit augmenter la proportion des espèces désertiques ; celles-ci dominent dans la région saharienne (Fezzan) où ne se trouvent plus que quelques espèces méditerranéennes à large distribution.

L'étude du matériel rassemblé par M. Guichard confirme les constatations faites par l'auteur italien.

Les récoltes faites en *Cyrénaïque* sont très peu abondantes et ne permettent pas de conclusion définitive ; on peut noter cependant que sur les 10 espèces capturées, 5 se retrouvent en Tripolitaine septentrionale ; sur les 5 autres, 3 sont strictement méditerranéennes et les 2 autres endémiques, mais à affinités méditerranéennes.

C'est dans la zone que j'ai nommée la *Tripolitaine septentrionale* que le plus grand nombre d'espèces ont été récoltées : 80, dont 54 n'ont pas été trouvées plus au sud. Sur ces 80 espèces, quelques unes seulement peuvent être qualifiées de strictement méditerranéennes, c'est à dire qu'elles n'atteignent pas, ailleurs qu'en Libye, la région saharienne ; un petit nombre aussi sont strictement sahariennes. La plus grande partie est formée d'éléments plutôt méditerranéens, mais qui, dans l'Afrique du N-W, atteignent la région saharienne ou y pénètrent plus ou moins loin, et d'espèces plutôt sahariennes, mais qui sont connues aussi de la région méditerranéenne.

Ces proportions faunistiques ne paraissent pas très différentes dans la zone du littoral et dans celle de la chaine côtière ; par contre, peu d'espèces sont communes à ces deux zones.

Dans la *Tripolitaine méridionale*, où une vingtaine d'espèces ont été capturées, on voit augmenter la proportion des éléments sahariens.

Au *Fezzan*, M. Guichard a pu réunir 49 espèces, dont 4 ont aussi été trouvées au Tibesti et 29 plus au nord. Les 2/3 de ces espèces sont strictement sahariennes ; une ou deux sont des espèces plutôt méditerranéennes ; le reste est formé d'élements sahariens qui, en Afrique du N-W., pénètrent plus ou moins dans la région méditerranéenne.

Un intérêt particulier s'attache au *Tibesti*, dont la faune hyménoptérienne était à peu près inconnue. L'expédition de M. Guichard a permis de rassembler 36 espèces, dont 22 n'ont pas été trouvées en Libye. Les 3/4 de ces espèces sont strictement sahariennes et on été trouvées dans d'autres localités du Sahara ou en Egypte ; le dernier quart est constitué par des espèces également sahariennes mais qui peuvent par endroits atteindre la région méditerranéenne. Dans ce matériel on ne trouve pas d'éléments que l'on pourrait qualifier d'éthiopiens. A ce point de vue, le Tibesti est donc comparable au Hoggar ; il serait cependant désirable de connaître encore sa faune durant les autres périodes de l'année.

Ces constatations montrent qu'il est difficule de tracer, en Libye, une limite entre les régions méditerranéene et saharienne. Il semble probable que la région côtière de la Cyrénaïque soit de type méditerranéen. La Tripolitaine septentrionale est considérée comme méditerranéenne par Zavattari. A vrai dire, sa faune est beaucoup moins typiquement méditerranéenne que celle du nord de l'Algérie et du Maroc ; l'on pourrait aussi admettre qu'elle est saharienne, avec mélange important d'éléments méditerranéens. La Tripolitaine méridionale est déjà nettement saharienne. Je pense qu'il appartient aux phytogéographes de fixer la ligne de démarcation entre les deux régions.

Je voudrais encore donner quelques indications sur la liste qui suit. Dans certains cas, pour les Ammophiles et les Stizes en particulier, j'ai donné pour plusieurs espèces des indications générales, qui dépassent un peu le cadre de cette étude faunistique.

Je n'ai indiqué dans la bibliographie que les travaux postérieurs aux études classiques de Kohl et de Handlirsch ; les travaux généraux récents, consacrés exclusivement ou en partie à la faune nord-africaine, ont été signalés au début de chaque genre. Les types des formes nouvelles, si aucune indication spéciale n'est donnée, seront déposés au British Museum, avec la plus grande partie du matériel récolté par M. Guichard ; des doubles et des paratypes se trouveront par la suite dans ma collection. L'abbréviation POL : OOL indique le rapport entre la distance qui sépare les ocelles postérieurs et celle qui sépare un ocelle postérieur de l'oeil.

Qu'il me soit permis enfin de remercier divers collègues dont le concours m'a été précieux pour l'élaboration de ce travail. M. P. Roth a bien voulu examiner divers Sphex et Ammophiles douteux et me donner son avis sur ces insectes. J'ai pu examiner divers types ou paratypes grâce à MM. Benson et Yarrow, du British Museum, E. Taylor, de l'University Museum d'Oxford, et au Dr M. Beier, du Naturhistorisches Museum, à Vienne.

Genre *AMMOPHILA* Kirby

(Voir : Roth 1928 ; Alfieri 1946)

Ammophila (Podalonia) tydei Le Guillou

Tr.N. : Sabratha, 1♀ ; Sidi Mesri, 1♀ ; Zliten, 1♂. Tr.S. : Hon oasis, 4♀ ; Zella oasis, 2♀ ; Hon, 1♀. Fe. : Mourzouk, 1♀ ; Oum el Araneb, 1♂, 1♀ ; Brak, 1♂, 3♀. Ti. : Zouar-Bardai Rd., 1♀ ; Bardai-Zouar Rd., 1♂.

La ♀ se distingue des 2 espèces suivantes par la présence de pilosité argentée couchée sur la face et sur les mésopleures, ainsi que par la pilosité dressée du thorax et du propodéum entièrement claire. Le ♂ est bien caractérisé par la forte pointe de la face inférieure des crochets du pénis.

Un des exemplaires de Hon oasis est un intéressant gynandromorphe, que j'ai brièvement décrit (*Mitt. schweiz. ent. Ges.*, 26 : 152, 1953).

Ammophila (Podalonia) mauritanica Mercet

Tr.N. : Gargaresc, 1♂, 1♀ ; Giado, 1♂. Fe. : In Aramas, 2♂, 2♀ ; Traghen, 1♂.

La ♀ se distingue des 2 autres espèces par les tarses 1 plus asymétriques, avec les épines très allongées, les soies de la face inférieure des fémurs 1 plus courtes (individus frais!), la ponctuation dense du mésonotum ; elle diffère de *tydei* par la pilosité noire du thorax (mais blanche sur le propodéum). Le ♂ est caractérisé par la partie antérieure libre du clypéus qui se rétrécit très peu en avant ; il a une pilosité argentée couchée bien développée sur le thorax. Chez les 2 sexes, les joues et le 2e article du funicule sont plus longs que chez les espèces voisines.

Ammophila (Podalonia) dispar Taschenberg

Tr.S. : Zella oasis, 7♂, 2♀.

La ♀ se distingue des 2 précédentes par le vertex, vu de face, moins arqué, par les pulvilli moins développés, la pilosité foncée non seulement sur le thorax, mais

aussi sur les faces latérales du propodéum, la présence, entre les longues épines du métatarse 1, d'épines plus petites, mais bien développées. Chez le ♂ il n'y a pas ou presque pas de pilosité argentée couchée sur les mésopleures ; le clypéus est encore plus rétréci en avant que chez *tydei*. Chez les 2 sexes, les ocelles postérieurs sont plus éloignés l'un de l'autre que chez les espèces voisines ; chez le ♂, POL = OOL ; chez la ♀, POL = presque OOL ; le pétiole est un peu plus court.

Ammophila (Podalonia) schmiedeknechti Kohl

Tr.S. : Zella oasis, 2♀ ; Jebel Soda, 1♀. Fe. : Mendil, 9♂, 1♀ ; Gatroun, 1♂.

Le ♂ a été décrit par Alfieri ; chez les exemplaires que j'ai examinés, le bord antérieur du clypéus est moins ondulé que ne le figure cet auteur. Les ailes ne sont pas enfumées comme chez la ♀ ; elles sont à peu près hyalines, avec une bordure foncée ; la pilosité dressée est entièrement noire.

Ammophila (Podalonia) ebenina Spinola (= *micipsa* Morice)

Tr. S. : Jebel Soda, 2♀.

Ammophila (Podalonia) atrocyanea massinissa Morice

Tr.S. : Jebel Soda, 4♀ ; Wadi Touzist, 1♀.

La taille (13–14 mm.) et la sculpture correspondent bien à ce qui est décrit pour cette forme, qui pourrait bien être une espèce distincte. Les reflets métalliques sont peu visibles.

Ammophila (Podalonia) minax Kohl

Tr.S. : Hon oasis, 1♀ ; El Harrug, 1♀ ; Jebel Soda, 4♂, 2♀. Fe. : Mendil, 1♀ ; in Aramas, 6♂, 8♀ ; Brak, 2♀.

Ces individus sont de taille très variable ; ♂ : 10–14 mm. ; ♀ : 11–16 mm. ; une ♀, fraîche éclose, un peu déformée, ne mesure que 9 mm. La coloration rouge est plus ou moins étendue ; elle est absente, chez certaines ♀, sur les pattes 2 et 3 ; les individus les plus clairs ont le pétiole rouge. Les reflets métalliques sont absents ou à peine indiqués à l'extrémité de l'abdomen, même chez le type que j'ai eu l'occasion d'examiner.

Ammophila (Eremochares) dives melanopus Lucas

Tr.N. : Leptis Magna, 1♀.

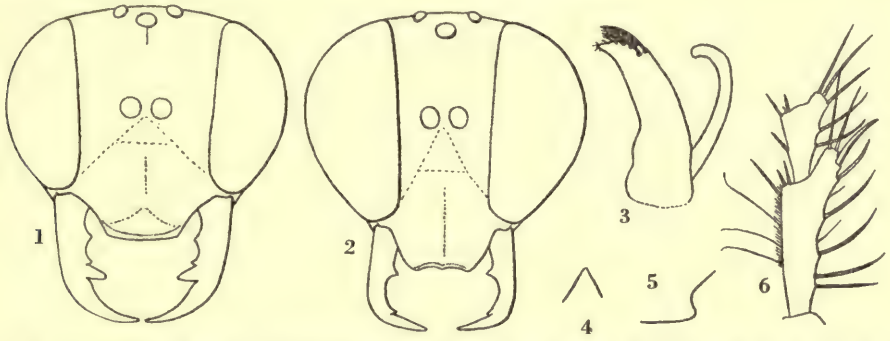
Ammophila (Eremochares) lutea Taschenberg

Fe. : In Aramas, 1♀ ; Mourzouk, 1♂, 1♀ ; Brak, 11 ♀ ; Sebha, 1♂.

Ammophila (Eremochares) foleyi n. sp.

Ti. : Zouar, 11.iii.53, 1♂ ; Enneri Meché, 21.iii.53, 1♂ ; paratypes. Maroc S. : Tata, iv.47, 1♀, type, 1♂, allotype (L. Berland leg., Mus. Paris) ; Foum el Hassan, iv.47, 1♀, paratype (L. Berland leg., coll. mea).

Roth (1930, 1934) a signalé un *Eremochares* provenant du Sahara central et qu'il a considéré, à la suite d'une détermination de Maidl, comme variété de *dolichostoma* Kohl ; il a indiqué les principaux caractères qui distinguent la variété de la forme typique. Les individus du Maroc et du Tibesti signalés di-dessus correspondent à la description de cette variété ; j'ai envoyé un ♂ (du Tibesti) à M. Roth, qui a bien voulu me confirmer qu'il s'agit effectivement de cette variété, dont il connait également un exemplaire de Foum el Tlaia (Sud Oranais). Cette forme me semble différer suffisamment de *dolichostoma* pour être considérée comme spécifiquement distincte. M. Roth me prie de la dédicacer au Dr Foley, de l'Institut Pasteur d'Alger, ancien Directeur du Service de Santé des Territoires du Sud, en reconnaissance de l'aide qu'il a apportée à l'entomologie saharienne en incitant les médecins-chefs des postes avancés de l'extrême Sud à récolter des Hyménoptères.



FIGS. 1–6.—*Ammophila* (*Eremochares*) *foleyi* n. sp. (1) Tête de la ♀. (2) Tête du ♂. (3) Armature génitale. (4) Extrémité d'une valve, vue normalement à sa surface. (5) Partie antérieure du mésosternum de la ♀, vu de profil. (6) Tarse antérieur de la ♀.

Cette espèce présente les caractères généraux signalés pour les espèces du sous-genre *Eremochares* : postpétiole subdilaté ; griffes avec 2 dents à la base ; 2e nervure récurrente aboutissant à l'extrémité de la 2e cellule cubitale ou même dans la 3e ; bords internes des yeux très faiblement convergents chez la ♀, plus nettement chez le ♂. J'ajouterai ici un caractère qui ne me semble pas avoir été signalé, mais qui est figuré par Alfieri : la brièveté de la galea des maxilles et des articles des palpes. Les *Eremochares* sont très voisins des *Parapsammophila* et pourraient leur être réunis.

♀. 20 mm. Tête et thorax noirs ; mandibules d'un jaune ferrugineux, à pointe noire ; partie antérieure du clypéus et extrémité des scapes d'un ferrugineux très sombre ; bord postérieur des tubercules huméraux et tegulae ferrugineux. Sont ferrugineux sur l'abdomen : le 1er tergite (sauf sa base), la partie terminale du 1er sternite, les 2e et 3e segments, les côtés du 4e tergite, le 4e sternite. Pattes ferrugineuses, à l'exception des parties suivantes, qui sont noires ou noirâtres : toutes les hanches, une parties des trochanters 1 et 2, les fémurs 3, entièrement ou à l'exception d'une tache ferrugineuse sur leur face inférieure, les tibias 3 à l'extrémité de leur face supérieure et sur la plus grande partie de leur face interne, l'extrémité du 5e

article des tarses 1, tous les articles des tarses 2 et 3. Ailes presque hyalines, la bordure très légèrement enfumée, les nervures d'un brun ferrugineux.

Clypéus (sauf sa ligne médiane et sa partie antérieure) et face, jusqu'un peu en dessus des antennes, avec une fine pubescence couchée, blanche, ne cachant pas la sculpture ; tubercules huméraux à pilosité couchée dense ; mésopleures, métapleures et propodéum, sauf son aire dorsale, avec une fine pubescence couchée blanche, un peu plus dense que sur la face, mais ne cachant pas complètement la sculpture (individus frais). Une pubescence moins dense se voit sur le collare et sur les angles antérieurs et postérieurs du mésonotum ; tête et thorax à pilosité dressée moyennement dense ; sur l'aire dorsale du propodéum, une nette pilosité dressée, dirigée obliquement en avant.

Mandibules avec 3 dents au bord interne (fig. 1) ; clypéus légèrement caréné sur une partie de sa ligne médiane, avec une fine ponctuation de base et des points un peu plus forts, espacés ; son bord antérieur avec une lamelle faiblement arquée ; 2e article du funicule à peu près 4,5 fois aussi long que large, le 3e, 3 fois ; haut de la face et vertex avec une microponctuation nette et une macroponctuation peu dense, les espaces en moyenne nettement plus grands que les points ; une ligne enfoncée très nette en avant de l'ocelle antérieur ; POL = OOL ; tête, vue par dessus, assez brusquement rétrécie derrière les yeux. Collare sculpté comme la face ; mésonotum brillant, à microsculpture très peu visible à × 30 ; sa partie antérieure à striation transversale irrégulière, plus ou moins mêlée de points ; les côtés de la partie postérieure moins nettement striés, en long, et plus nettement ponctués ; le milieu de la partie postérieure et le scutellum brillants, à ponctuation espacée ; les méso- et métapleures apparaissent, sous la pilosité, plus ou moins rugueuses et ponctuées ; vu de profil, le mésosternum est nettement saillant en avant (fig. 5). Aire dorsale du propodéum brillante, avec une strie longitudinale médiane plus ou moins développée et de nombreuses stries latérales ; celles-ci, un peu sinueuses, se rencontrent sur la ligne médiane en formant un angle très aigu ; chez les spécimens que j'ai vus, ces stries ne forment pas, en arrière, des cercles concentriques, comme chez l'individu décrit par Roth ; sous la pilosité, les faces latérales du propodéum paraissent densément et un peu irrégulièrement striées. Pétiole légèrement courbé ; sa longueur égale celle du 1er article des tarses 3, augmentée de la moitié du 2e article ; métatarse 1 : fig. 6 ; hanches 1 nettement anguleuses en arrière ; tibias 2 avec 2 éperons, l'externe égalant la moitié de l'interne. La 2e nervure récurrente aboutit tout à l'extrémité de la 2e cellule cubitale ou est interstitielle.

♂. 17–20. mm. Clypéus, scapes et tubercules huméraux noirs. Abdomen comme chez la ♀, mais le 1er tergite avec une ligne noire sur presque toute sa longueur. Pattes comme chez la ♀, mais les fémurs 3 sont ferrugineux sur toute leur face inférieure, le 5e article des tarses 1 est entièrement noir et le métatarse 2 ferrugineux à la base. La pilosité couchée du clypéus et de la face est un peu plus dense que chez la ♀ ; le reste de la pilosité comme chez celle-ci.

Mandibules courbées presque à angle droit, avec 2 dents au bord interne (fig. 2), l'une, basale, assez forte, l'autre, subapicale, peu développée ; clypéus avec une

carène longitudinale médiane plus nette que chez la ♀, ce qui le rend légèrement tectiforme ; on peut dire aussi que ses deux moitiés sont légèrement concaves ; son bord antérieur est un peu échancré, avec une saillie médiane nette chez le type, un peu moins accusée chez les individus du Tibesti ; vu de profil, le clypéus apparait presque rectiligne, très légèrement relevé ; la distance interoculaire, sur le bas de la face, est légèrement supérieure à la longueur des 2 premiers articles du funicule. Sculpture des différentes parties du corps comme chez la ♀. Le pétiole est presque aussi long que les 2 premiers articles du tarse 3 ; sternites 5–7 échancrés au milieu de leur bord postérieur, 5–6 avec un sillon longitudinal médian dans leur partie postérieure ; le 8e sternite, aplati, est arrondi à l'extrémité chez le type, échancré chez les 2 autres spécimens. L'armature génitale montre des valves pointues à l'extrémité et des crochets régulièrement courbés (fig. 3 et 4). Chez le type, les tibias 2 montrent 2 éperons bien développés ; un des individus du Tibesti a 2 éperons d'un côté, 1 seul de l'autre ; chez l'autre ♂, il n'y a qu'un seul éperon de chaque côté ; ces éperons manquants ont peut être été brisés ; leur point d'insertion existe.

Cette nouvelle espèce se distingue facilement de *dives* Brullé par le mésosternum moins pointu en avant, le peigne de la ♀ à épines longues, la sculpture, etc. Elle se distingue de *lutea* Taschenberg et *algira* Kohl par le mésosternum plus saillant, la structure du clypéus, la présence d'une dent basale aux mandibules, le métatarse 1 de la ♀ moins asymétrique, la coloration rouge moins étendue que chez le 1er, mais plus, en particulier sur les pattes, que chez le 2e. C'est sans doute de *dolichostoma* Kohl qu'elle est la plus voisine ; j'ai pu étudier le type de cette espèce, provenant d'Arabie, et une autre ♀ déterminée par Kohl, originaire d'Aden. Ces 2 ♀ de *dolichostoma* se distinguent de *foleyi* par le clypéus non tectiforme, le prosternum moins saillant (caractère peu visible chez le type, à cause de l'épingle), la face dorsale du propodéum tout à fait glabre, avec des stries plus régulières, pas du tout sinueuses et différemment agencées : dans la partie antérieure, elles sont très obliques, comme chez *foleyi*, mais, dans toute la moitié postérieure, elles sont très peu obliques, simplement arrondies au milieu ou se rencontrant là sous un angle très obtus. La couleur rouge est plus étendue sur les pattes 3 ; chez l'individu d'Aden, tout le clypéus est ferrugineux. La pilosité, chez le type, est arrachée et ne permet pas de comparaison ; chez la ♀ d'Aden, elle est plus dense sur les mésopleures, qui contrastent ainsi plus nettement avec les métapleures. D'après les dessins d'Alfieri, le clypéus de *dolichostoma* ♂ n'est pas tectiforme et il est beaucoup plus large en avant que chez *foleyi* ; les valves sont plus pointues à l'extremité, les crochets un peu différents.

Ammophila (s.s.) haimatosoma Kohl

Tr. N. : Leptis Magna 1♂ 2♀.

Ces individus sont de coloration plutôt foncée. Sont rouges sus le thorax des ♀ : le prothorax, des stries latérales au mésonotum, de petites taches au scutellum, au propodéum et sur les pleures.

Ammophila (s.s.) gracillima Taschenberg

Tr.S. : Hon oasis, 1♂. Fe. : Brak, 1♀.

Ammophila (s.s.) producticollis Morice

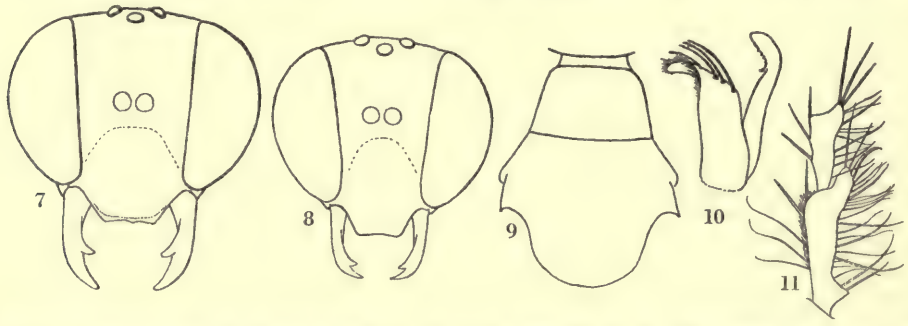
Ti. : Enneri Mechè, 1♂.

Ammophila (s.s.) guichardi n. sp.

Tr.N. : Giado, 23.vi.51, 1♀ type, 1♂ allotype. Tunisie : Gafsa, 1♂ paratype.

♀. 20 mm. Tête et thorax noirs, avec les parties suivantes ferrugineuses : les mandibules (sauf leur pointe), toute la partie apicale du clypéus, les scapes, une tache sur la partie supérieure des pédicelles, les tubercules huméraux, les tegulae ; abdomen ferrugineux, avec la pétiole, la face dorsale du 1er et du 6e tergites un peu obscurcis, mais pas franchement noirs ; pattes ferrugineuses, avec une partie des hanches et une petite tache à la base de la face supérieure des fémurs 3, noires. Ailes hyalines ; nervures ferrugineuses à la base, devenant brunes à l'extrémité.

Tête, sauf l'extrémité du clypéus et le vertex, avec une pilosité argentée couchée très dense, cachant la sculpture ; les faces latérales et inférieure du thorax, le propodéum, sauf son aire dorsale, avec une pilosité semblable, uniforme, mais qui s'arrache facilement ; la pilosité couchée est assez dense aussi sur les côtés du collare et du mésonotum et sur le milieu de l'aire dorsale du propodéum ; elle est moins dense sur les autres parties du thorax, laissant voir la sculpture chez l'unique ♀ examinée, qui est un peu usée ; quelques poils dressés sur les côtés de la face ; une



FIGS. 7–11.—*Ammophila* (*s.s.*) *guichardi* n. sp. (7) Tête de la ♀. (8) Tête du ♂. (9) Dos du thorax de la ♀. (10) Armature génitale. (11) Tarse antérieur de la ♀.

longue pilosité dressée, fournie, sur les tempes et les côtés du prosternum ; pas de pilosité dressée sur le reste du thorax ; hanches garnies de pilosité couchée ; pattes antérieures avec les psammophores bien développés ; abdomen à peu près glabre, avec une pruinosité microscopique peu visible.

Bords internes des yeux un peu convergents vers le bas (fig. 7) où leur distance est très légèrement inférieure à la longueur des articles 2 et 3 du funicules réunis ; mandibules avec une seule dent au bord interne ; le clypéus est assez bombé dans son ensemble, mais la zone apicale glabre est aplatie ; le bord antérieur est légèrement échancré ; le 2e article du funicule est 5 fois aussi long que large, le 3e, 3 fois ; POL : OOL = 4 : 5. Le thorax est relativement étroit et allongé ; le pronotum est plus allongé que chez des espèces comme *sabulosa* ou *propinqua*, mais plus court que

chez *producticollis* (fig. 9) ; il est régulièrement rétréci en avant et sa face dorsale est arrondie, sans tubercule ; sa surface, pour autant qu'on la voit, est lisse, avec une fine microsculpture ; un court sillon longitudinal médian près de son bord postérieur ; le mésonotum, brillant, montre aussi une fine microsculpture et quelques petits points très espacés ; les mésopleures, visibles là où la pilosité est arrachée, ont une microsculpture et une ponctuation un peu plus denses ; mésosternum simple ; scutellum irrégulièrement strié ; aire dorsale du propodéum avec une striation transversale nette, assez régulière et assez forte. Le pétiole est de la longueur des tibias 3 ou des articles 1 à 3 des tarses 3. Le métatarse antérieur présente à sa base, du côté externe, une très forte dent triangulaire (fig. 11) ; son bord externe, jusqu'à la forte épine apicale, porte un peigne formé d'une vingtaine de soies transparentes, fines ; des soies semblables existent sur les articles suivants ; quelques unes de ces soies, un peu plus fortes, correspondent sans doute aux épines des autres espèces ; tibias 2 avec un seul éperon ; griffes sans dent. Les cellules cubitales 2 et 3, nettement rétrécies dans le haut, sont de même longueur sur la nervure radiale.

♂. 17–19 mm. Coloration un peu plus foncée que chez la ♀ ; le clypéus n'est ferrugineux que le long de son bord antérieur ; la face supérieure du scape et les tubercules huméraux sont rembrunis ; le pétiole est en grande partie foncé ; la partie médiane des tergites 5–7 est obscurcie.

Le ♂ de Giado, très usé, a la pilosité en grande partie arrachée. Le ♂ de Gafsa est tout à fait frais ; tout le clypéus et le bas de la face sont couverts de pilosité argentée couchée, tandis que le haut de la face et le vertex sont très peu velus ; la pilosité couchée du thorax est comme chez la ♀ ; il y a de plus une pilosité dressée, formée de longs poils blancs, pas très denses ; les poils dressés manquent sur l'aire dorsale du propodéum.

La tête est, comme toujours, plus étroite que chez la ♀ (fig. 8) ; la distance interoculaire sur le bas de la face égale la longueur des 2 premiers articles du funicule ; mandibules avec une seule dent, préapicale, au bord interne ; labre simple ; clypéus assez semblable à celui de la ♀ ; articles du funicule comme chez celle-ci. Forme et sculpture du thorax comme chez la ♀, mais le collare est plus nettement ponctué ; grâce à l'absence de pilosité chez le ♂ de Giado, on peut noter la présence d'une suture épisternale aux mésopleures ; on peut voir aussi que les métapleures sont ponctuées comme les mésopleures, à peine striées, et que les faces latérales du propodéum sont lisses et ponctuées en avant, striées en arrière. Pétiole comme chez la ♀ ; 7e tergite de forme normale, rétréci en arrière ; 8e sternite non caréné, à peine échancré à l'extrémité ; l'armature génitale (fig. 10) montre des valves à extrémité allongée, ne portant que peu de fortes soies et des crochets à tête non dilatée. Tarses 1 sans peigne. La 2e cellule cubitale est moins rétrécie que chez la ♀.

Cette espèce, à coloration rouge étendue et pilosité argentée très fournie, a l'aspect nettement " désertique ". Par la forme de la tête, elle est en quelque sorte intermédiaire entre les espèces à clypéus court et celles à clypéus long (groupe de *nasuta*) ; elle se distingue nettement de ces dernières par le clypéus du ♂ régulièrement bombé et largement tronqué et par les crochets de l'armature à tête normale. En suivant les tables usuelles, on pourrait être amené à *albotomentosa* Morice ou *erminea* Kohl.

La 1ère de ces espèces a une vestiture argentée encore plus dense sur la tête et le dos du thorax, un pétiole plus court, un clypéus différent, un 7e tergite du ♂ très large à l'extrémité ; la 2e a la face plus large, le clypéus plus court, une pilosité couchée moins développée, une pilosité dressée beaucoup plus abondante. La ♀ de *guichardi* semble bien caractérisée par la présence d'une seule dent au bord interne des mandibules et par la structure du métatarse 1 ; chez *producticollis* et chez *gracillima*, le peigne est également formé de nombreuses et fines soies, mais le métatarse ne montre pas de dent basale. Malgré son collare beaucoup plus court, c'est probablement de *producticollis* que cette nouvelle espèce est la plus proche ; elle devrait peut être se placer dans le sous-genre *Argyrammophila* Gussakovskij.

Ammophila (s.s.) hemilauta Kohl

Tr.N. : Gargaresc, 4♂.

Ammophila (s.s.) djaouak n. sp.

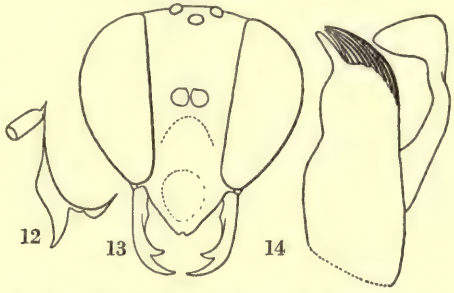
Tr.N. : Gargaresc, vi.52, 1♂ type.

♂. 20 mm. Tête et thorax noirs ; bord antérieur du clypéus et tegulae ferrugineux; abdomen ferrugineux ; pétiole un peu obscurci à l'extrémité ; base du 1er tergite et une étroite ligne dorsale, n'atteignant pas l'extrémité, sur les tergites 1 et 2, noires. Pattes ferrugineuses, avec les parties suivantes noirâtres : une partie des hanches, les trochanters 3, la face interne des fémurs 3 et la partie basale de leurs autres faces, l'extrémité des tibias 3, les tarses 3 sauf la base des 2 premiers articles. Ailes très légèrement enfumées, avec la bordure légèrement plus foncée, les nervures ferrugineuses à la base, devenant ensuite brunes.

Une pilosité argentée couchée dense cache la sculpture sur le clypéus, la face, les tempes, les côtés du prothorax, les mésopleures, le mésosternum, la partie postérieure des métapleures, la plus grande partie des faces latérales du propodéum ; elle est assez dense sur le mésonotum pour ne laisser voir la sculpture qu'en partie (l'individu est très frais) ; elle est très peu développée sur le vertex, le collare, toute la partie antérieure des métapleures (qui tranche ainsi nettement avec les mésopleures densément velues), la face dorsale du propodéum. La pilosité dressée, blanche, est assez longue sur les côtés de la face, les tempes, le prosternum, le collare ; elle est beaucoup plus courte sur le reste du thorax et le propodéum ; l'aire dorsale du propodéum montre des poils assez longs, dirigés obliquement en avant. Abdomen à pruinosité assez développée. Hanches et trochanters à dense pilosité couchée.

La face est étroite et allongée, avec les yeux nettement convergents vers le bas, où leur distance égale la longueur du 2e article du funicule (fig. 13) ; mandibules avec une seule dent préapicale au bord interne et une dent très obtuse à la base en dessous ; le labre montre avant son extrémité une longue pointe dressée ; une pointe semblable existe, mais à l'extrémité même du labre, chez les ♂ de *hemilauta* Kohl et *laevicollis* André ; le clypéus est convexe à la base, puis concave, puis rétréci et relevé en avant, où il montre une légère échancrure ; son profil est donc sinueux (fig. 12) ; 2e article du funicule 5 fois aussi long que large, le 3e, 3 fois ; POL = OOL. Le collare est moyennement allongé, comme chez *guichardi* ; il est régulièrement

arrondi en avant et sur sa face dorsale ; celle-ci est brillante, avec de petits points espacés ; la surface du mésonotum apparaît, sous la pilosité, densément striée en travers ; le scutellum et le postscutellum sont striés longitudinalement ; dans leur partie glabre, les métapleures montrent une surface demi-brillante, avec une ponctuation très nette, moyennement dense ; face dorsale du propodéum striée transversalement ; les stries sont serrées, sinueuses. Le pétiole est de la longueur des tibias 3 ou des 3 premiers articles des tarses 3 ; le 7e tergite est assez large et assez largement tronqué à l'extrémité ; le 8e sternite est large, non caréné, un peu échancré à l'extrémité ; l'armature génitale montre des valves brusquement rétrécies à l'extrémité où elles se terminent par une pointe étroite et des crochets dont la tête est fortement développée (fig. 14). Tibias 2 avec un seul éperon ; griffes sans dent.



FIGS. 12–14.—*Ammophila* (*s.s.*) *djaouak* n. sp. ♂. (12) Clypéus vu de profil. (13) Tête vue de face. (14) Armature génitale.

Par la conformation de son clypéus et de son armature génitale, cette espèce appartient sans doute au groupe de *nasuta* ; elle se distingue facilement de *nasuta* Lepeletier, *quadraticollis* Costa et *strumosa* Kohl par la forme du collare, la pilosité argentée plus développée, les pattes différemment colorées, les derniers segments sans coloration bleue, l'armature génitale. Elle se distingue de *hemilauta* Kohl par les pattes plus claires, la face plus étroite, le labre, le collare plus allongé, la striation plus dense du mésonotum, le 7e tergite plus large, l'armature génitale bien différente (celle d'*hemilauta* est figurée par Alfieri). Elle se distingue d'*albotomentosa* Morice par la vestiture moins dense du thorax (métapleures glabres, par exemple), la face plus étroite, le clypéus et le pétiole plus longs, l'armature génitale.

Ammophila (s.s.) quadraticollis Costa

Tr.N. : Near Tripoli, 1♂, 1♀ ; Sidi Gelani, 1♂ ; Gargaresc, 3♀ ; Leptis Magna, 1♀.

Ammophila (s.s.) egregia Mocsary

Ti. : Enneri Kudi, 1♀.

En Syrie (loc. typ.) et en Palestine, les ♀ ont le thorax et le propodéum en grande partie rouges ; le pétiole, le 1er tergite (taché de noir sur le dos) et le 2e segment sont rouges ; les ailes sont jaunes. D'après la description d'Alfieri, les spécimens égyptiens sont semblables. Cette ♀ du Tibesti est plus foncée ; sont rouges sur le

thorax : le prothorax, de grandes taches aux angles antérieurs du mésonotum, de petites taches à la partie antérieure des mésopleures ; le propodéum est noir, le 2e segment presque entièrement noir ; ailes brunes, à partie basale jaune. D'autres races existent dans la région éthiopienne ; l'espèce devrait peut être se nommer *insignis* Sm.

Ammophila (s.s.) heydeni Dahlbom

Cy. : Ras el Hilal, 1♂ ; Derna, 2♀ ; 1 km. east Benghazi, 2♂.

Ammophila (s.s.) propinqua Taschenberg

Ti. : Tao, 1♀ ; Zouarke, 1♀ ; Dourzo, 1♀.

J'ai signalé (1951*b*) que l'on rencontre au Maroc 2 formes distinctes de cette espèce ; aucune des deux ne semble identique à *rubripes* Spinola d'Egypte ; tout le groupe serait d'ailleurs à revoir. Disons ici que la ♀ de Zouarke correspond à la forme que j'ai nommée saharienne ; les deux autres sont semblables aux individus que j'ai signalés de Mauritanie (1953*a*) sous le nom de *sp. aff. rubripes* Spin. ; La pilosité des faces latérales du thorax est encore plus dense que chez la forme saharienne et la striation transversale est moins serrée dans la partie postérieure du mésonotum.

Ammophila (s.s.) erminea Kohl

Tr.N. : Bir el Hamera, 1♂. Tr.S. : Jebel Soda, 2♂. Fe. : Mendil, 2♀ ; Oum el Araneb, 1♂ ; Traghen, 1♂. Ti. : Enneri Meché, 4♀.

Ammophila (s.s.) poecilocnemis Morice

Ti. : Zouar-Bardai Rd., 1♀.

Je ne suis pas certain de cette détermination, car cette ♀ diffère un peu d'individus de *poecilocnemis* tunisiens que j'ai étudiés, en particulier par sa coloration. Pétiole rouge ; tergites 1–4 rouges avec une bande dorsale noire ; 5 et 6 noirs avec reflets bleus pas très développés. Sont rouges sur les pattes : une partie des trochanters 1 et 2, les fémurs, tibias et tarses 1 et 2, une grande tache à l'extrémité des fémurs 3, une tache à la base des tibias 3. La pubescence est un peu plus dense sur les mésopleures que sur les métapleures, mais ne forme cependant pas de tache nette comme chez *holosericea* F. Tibias 2 avec 1 seul éperon. J'ai vu un spécimen semblable du Hoggar (Mateu leg.).

Ammophila (s.s.) apicalis electa Kohl

Cy. : Derna, 2♀. Tr.N. : near Garian, 1♀.

Genre ***SPHEX*** Linné

(Voir : Roth 1925 ; Honoré 1944)

Sphex (Palmodes) melanarius Mocsary

Tr.N. : Leptis Magna, 1♂

Sphex (Calosphex) niveatus Dufour

Fe. : Traghen, 1♂.

Sphex (Prionyx) viduatus Christ

Tr.N. : Garian. Fe. : Oum el Araneb, 1♂ ; Traghen, 2♂ ; Brak, 1♂.

Sphex (Prionyx) lividocinctus Costa

Tr.N : Garian, 1♀.

Sphex (Prionyx) albisectus Lepeletier

Tr.N. : Tagiura, 1♂ ; Cussabat, 1♀.

Sphex (Priononyx) stschurowskyi hyalipennis Kohl

Tr.N. : 20 km. W. of Garian, 1♀.

Sphex (Priononyx) chobauti Roth subsp.

Tr.N. : Gargaresc, 1♂, 2♀ ; Leptis Magna, 1♀.

Le ♂ ne m'a pas paru différer essentiellement d'exemplaires de *chobauti* que j'ai récoltés au Maroc ; c'est également l'avis de M Roth qui a examiné ce spécimen. Il y a en tous cas identité presque complète dans la forme et la pilosité des sternites 6,7 et 8 ; à ce point de vue, *eatoni* Saunders est bien différent.

Par leur taille, la pilosité dressée assez dense des mésopleures, des faces latérales et supérieure du propodéum, par leurs ailes postérieures uniformément enfumées, les ♀ rappellent également davantage *chobauti* que *eatoni* ; par contre, elles se rapprochent de cette dernière espèce par la présence d'une pilosité argentée couchée assez dense sur la face, le collare et le mésonotum. Il faut noter cependant que cette pilosité est un peu moins dense que chez *eatoni* (elle semble s'arracher facilement), qu'elle est moins étendue sur le vertex et le collare et surtout que les parties qui en sont couvertes présentent également des poils noirs dressées ; ces poils sont un peu moins développés que chez les *chobauti* typiques, assez courts sur le mésonotum ; ils sont absents chez *eatoni*. En relation avec cette pilosité argentée, les surfaces qui en sont couvertes ont une sculpture nettement plus fine que chez la forme typique.

Ce ♂ et ces ♀ appartiennent-ils à la même forme ? S'agit-il d'une espèce distincte ou d'une race de *chobauti* ? Il m'est difficile de répondre pour le moment. Il serait d'ailleurs nécessaire de tirer au clair les rapports entre *chobauti* Roth, *eatoni* Saunders, *lugens* Kohl, *sirdariensis* Radoszkowsky, *macula* Fabricius et *funebris* Berland.

Sphex (s.s.) pruinosus Germar

Tr.N. : Leptis Magna, 3♂, 1♀.

Sphex (s.s.) umbrosus taschenbergi Magretti

Ti. : Zouarké, 1♂.

D'après Kohl et d'après Honoré, la race habituelle de la Méditerranée orientale et de la Basse Egypte, que l'on rencontre également dans une partie de la région éthiopienne, est *S. umbrosus metallicus* Christ ; elle est caractérisée entre autres par la pilosité dressée qui est noire sur les tempes et une partie du thorax, mais blanche sur le clypéus et la face. Chez les individus de la race *taschenbergi*, décrite de Metemma, dans le Soudan, la pilosité dressée est entièrement noire sur la tête et le thorax. C'est à cette race qu'appartiennent le ♂ du Tibesti, ainsi que 2 ♀ d'Assouan (Haute Egypte) de ma collection.

Sphex (s.s.) afer Lepeletier

Tr.N. : Bugheilan, 2♂, 1♀.

Sphex (s.s.) flavipennis Fabricius

Tr.N. : Leptis Magna 2♂, 1♀.

La ♀ a le scutellum, le postscutellum et l'aire dorsale du propodéum ferrugineux.

Sphex (s.s.) maxillosus Fabricius

Tr.N. : Leptis Magna, 1♂

Sphex (s.s.) libycus n. sp.

Tr.N. : Leptis Magna, 22.vi.52, 1♂ allotype, 1♂ paratype. Cyrénaïque : Porto Bardia, 15.viii.25, 1♀ type (Krüger leg., coll. von Schulthess, Inst. ent. E.P.F. Zürich).

La ♀ type a été signalée par von Schulthess et Roth (1926), à la suite d'une détermination de Maidl, comme *Sphex maxillosus* F. var. *tota nigra, alis valde infumatis*. Les 2 ♂ de Leptis Magna me paraissent devoir être associés à cette ♀. Il s'agit très probablement d'une espèce distincte, proche de *maxillosus* Fabricius, et surtout de *flavipennis* Fabricius.

♀. 22 mm. Noire ; mandibules ferrugineuses à pointe noire ; tibias et tarses 1, face antérieure des tibias 2, tarses 2, extrémité des tarses 3 d'un ferrugineux très sombre ; ailes très fortement enfumées. Face et clypéus avec une pilosité argentée couchée ; une légère pubescence rousse au sommet du collare ; toute la pilosité dressée, y compris les soies du clypéus, est noire ou d'un brun très foncé.

La tête est un peu plus rétrécie derrière les yeux que chez *flavipennis* ; comme chez cette espèce, la face dorsale du propodéum et le haut de ses faces latérales, jusqu'au sillon stigmatique, sont assez nettement striés transversalement ; la face dorsale du pétiole, depuis l'extrémité du ligament articulaire, est un peu moins d'1,5 fois aussi longue que large.

♂. 20–22 mm. Coloration et pilosité comme chez la ♀, mais les pattes sont entièrement noires.

Morphologiquement, le ♂ est très voisin de *flavipennis* ; comme chez celui-ci, le bord antérieur du clypéus n'est pas distinctement échancré et les touffes de poils des côtés du 7e sternite sont relativement courtes ; la face dorsale du pétiole est 1,75 fois aussi longue que large.

Dans ce groupe d'espèces, seul *afer* ♂ a l'abdomen noir, mais il a les ailes moins foncées que *libycus*, la pilosité dressée plus brune, la pruinosité de l'abdomen plus claire. D'ailleurs, *afer*, de même que *atrohirtus* Kohl se distinguent de *libycus* par la taille plus forte, le pétiole plus court, la pilosité beaucoup plus développée sur le 1er tergite du ♂ et sur les fémurs de la ♀. *S. maxillosus* a la face dorsale du propodéum moins nettement striée, le pétiole un peu plus long et, chez le ♂, le bord antérieur du clypéus assez nettement échancré et les touffes de poils du 7e sternite plus longues. C'est de *flavipennis* que *libycus* est le plus voisin ; je n'ai pas réussi à trouver de différences morphologiques nettes, ce qui ne veut pas dire qu'il n'en existe pas! Si j'admets que *libycus* est une expèce distincte, c'est parceque sa coloration est très frappante, que l'on ne remarque pas de tendance au mélanisme chez *flavipennis*, et surtout parcequ'il existe des *flavipennis* typiques dans les mêmes localités que *libycus*.

Genre ***PHILANTHUS*** Fabricius

(Pour ce genre et le suivant, voir : Mochi 1939*a* ; de Beaumont 1949*a*)

Philanthus triangulum abdelkader Lepeletier

Cy. : Tolmeta, 1♂. Tr.N. : Tripoli, 1♂ ; Sidi Mesri, 3♂, 1♀ ; Gargaresc, 2♂, 1♀ ; Tagiura, 1♂.

Philanthus rutilus Spinola

Fe. : In Aramas, 1♀. Ti. : Wadi Wour, 4♀ ; Zouar, 1♂, 1♀ ; Dourzo, 1♂.

Ces individus présentent les caractères morphologiques typiques de l'espèce, mais ils sont de coloration variable.

La ♀ du Fezzan a les angles du collare jaunes ; le scutellum (ferrugineux) et le postscutellum ont le bord postérieur jaune ; 1er tergite ferrugineux, le 2e un peu ferrugineux au milieu et sur les côtés ; le reste de ce tergite et les tergites 3–5 sont jaunes ; cette ♀ rapelle donc la f. *pachecoi* Giner Mari, du Sahara espagnol, et c'est ainsi que je l'ai déterminée.

Les ♀ du Tibesti, par contre, sont très semblables à celles de Basse Egypte ; sur la face, en dessus des antennes, les dessins jaunes sont un peu plus développés ; le thorax est taché de ferrugineux (un peu jaunâtre par endroits) aux angles du collare, au scutellum et souvent au postscutellum ; l'abdomen est ferrugineux et noir, sans dessins jaunes. Chez les ♂ du Tibesti, la coloration jaune est également un peu plus étendue sur le haut de la face que chez les individus égyptiens ; l'un a le thorax noir l'autre montre des taches ferrugineuses et jaunes aux angles du collare et au scutellum ; les tergites abdominaux sont en grande partie jaunes ; le 1er est taché de noir et de ferrugineux, le 4e et le 5e ont une bande noire à la base. Ici donc, les ♀ présentent la coloration de la race typique et les ♂ celle de la race *pachecoi*.

Philanthus variegatus ecoronatus Dufour

Tr.N. : Garian, 1♂, 2♀ ; Garian Hills, 1♂. Fe. : Brak, 1♀. Ti. : Enneri Meche, 1♂.

J'ai signalé que cette espèce présente une forte variation individuelle et géographique, portant sur la taille, la coloration et la densité de la ponctuation.

Les spécimens de Tripolitaine sont assez semblables à ceux de Biskra ; ils sont cependant un peu plus foncés et la ponctuation, chez les ♂, est plus dense. La ♀ du Fezzan et le ♂ du Tibesti, par la couleur jaune étendue et par la sculpture de l'abdomen, sont très semblables aux individus du Maroc méridional que j'ai décrits ; j'ai également vu un ♂ de ce type provenant du Hoggar (Mus. Paris). Il semble donc bien qu'il existe une race saharienne assez constante.

Philanthus genalis Kohl

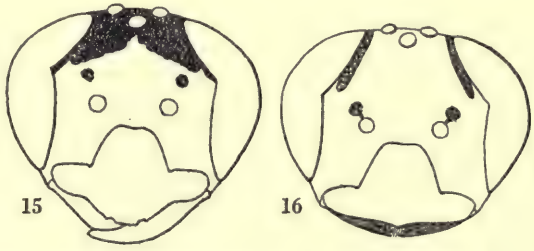
Tr.S. : Hon oasis, 1♀. Fe. : Mourzouk, 1♀ ; Gatroun, 1♂ ; Sebha, 3♂, 1♀.

Philanthus schulthessi Maidl

Ti. : Wadi Wour, 1♂, 1♀ ; Tao, 1♂, 3♀.

J'ai comparé ces spécimens au type, provenant de l'Ile de Tuti, près de Khartoum (Mus. Vienne) ; c'est à c'est espèce que se rattachent également les 3 ♀ de Mauritanie que j'ai citées (1953*a*) sous le nom de *minor* Kohl subsp. Il me semble utile de donner quelques compléments à la description originale, basée sur des ♀ seulement.

L'espèce fait partie du groupe de *coarctatus* dont les représentants sont caractérisés par les épimères mésothoraciques lisses ou ne montrant que quelques points microscopiques et par les barbes du clypéus du ♂ qui se rencontrent au milieu. Les bords



FIGS. 15–16.—*Philanthus schulthessi* Maidl. (15) Tête de la ♀. (16) Tête du ♂.

supérieurs des lobes latéraux du clypéus sont horizontaux chez la ♀ (fig. 15) et descendent obliquement vers l'extérieur chez le ♂ (fig. 16) ; les joues de la ♀ égalent la largeur du 2e article du funicule à sa base, celles du ♂ la longueur du 3e article du funicule, augmentée du tiers du 4e ; les parties inférieures de la face, de chaque côté du clypéus, sont très brillantes, avec une ponctuation très fine et peu serrée, les espaces étant beaucoup plus grands que les points. Chez la ♀, POL : OOL = 2 : 1 et OOL est un peu inférieur au diamètre d'un ocelle ; chez le ♂ ,POL : OOL = 3 : 2 et OOL égale le diamètre d'un ocelle. Les fémurs de la ♀ montrent à leur face inférieure une rangée de soies dont les plus développées sont plus longues que le diamètre du fémur. L'extension des dessins clairs varie naturellement un peu ;

chez le ♂, ces dessins sont d'un jaune plus intense que chez la ♀ et beaucoup plus développés que chez celle-ci ; l'abdomen est presque entièrement jaune.

Cette espèce se distingue facilement de *coarctatus* Sp inola par sa couleur jaune plus étendue, le 1er tergite moins étroit, les joues plus longues. Elle se distingue de *ammochrysus* Schulz par la coloration un peu différente, la taille en moyenne plus faible, la ponctuation beaucoup moins dense des côtés de la face, la zone chagrinée du propodéum plus développée, la présence de longues soies aux fémurs 3 de la ♀. Elle se distingue de *minor* Kohl par la coloration jaune plus étendue, les ailes moins teintées de jaune, les joues plus longues, la ponctuation un peu plus espacée du bas de la face, le collare moins échancré au milieu, la zone chagrinée du propodéum à sculpture un peu moins forte, la ponctuation plus forte et plus dense des mésopleures et des tergites. Elle se distingue de *pallidus* Klug par les dessins noirs plus développés, la présence de longues soies aux fémurs 3 de la ♀ et d'autres caractères que je ne puis préciser pour l'instant, n'ayant pas sous les yeux de *pallidus* typiques d'Egypte.

Philanthus coarctatus Spinola

Tr.N. : Sabratha, 6♂, 1♀ ; Gargaresc, 3♂, 1♀ ; Leptis Magna, 2♀ ; Garian, 1♀ ; Garian Hills, 1♀. Fe. : Mourzouk, 4♂, 1♀ ; Oum el Araneb, 1♂. Ti. : Wadi Wour, 2♀ ; Zouar, 2♂, 2♀ ; Zouar-Bardai Rd., 1♂ ; Enneri Meché, 3♂ ; Enneri Kudi, 1♀ ; Bardai-Zouar Rd., 1♀ ; Zouarké, 1♀.

La coloration jaune est en général peu étendue et le 1er segment de la ♀ est rarement rouge. La ♀ de Mourzouk, par contre, a les dessins, d'un blanc jaunâtre, exceptionellement étendus ; elle montre en particulier 2 grandes taches au propodéum et une bande continue sur le 1er tergite (qui est rouge) ; le 3e tergite reste cependant très peu taché.

Genre ***PSEUDOSCOLIA*** Radoszkowsky

(= *Philoponus* Kohl, *Philoponidea* Pate)

Pseudoscolia dewitzi Kohl

Tr.N. : Near Garian, 1♂. Fe. : In Aramas, 1♂.

Ces 2 ♂ diffèrent des individus typiques par leur collare moins profondément échancré, ce qui les rapproche de *lyauteyi* Schulthess ; par leurs autres caractères, ce sont bien des *dewitzi*.

Genre ***CERCERIS*** Latreille

(Voir : de Beaumont 1952*a*)

Cerceris sabulosa algirica Thünberg

Tr.N. : Leptis Magna, 1♀ ; Giado, 2♂ ; Garian, 1♂ ; Bugheilan, 1♀.

Cerceris fischeri Spinola

Tr.N. : Leptis Magna, 1♀ ; Garian, 2♂, 3♀ ; Bugheilan, 2♂, 2♀. Fe. : Brak, 1♂.

Cerceris circularis Fabricius

Tr.N. : Gargaresc, 1♀ ; Tagiura, 1♀ ; Garian, 2♂.

Ces individus ont les dessins jaunes très développés sur l'abdomen, mais relativement peu sur le thorax. L'aire dorsale du propodéum est lisse au milieu.

Cerceris pulchella Klug

Tr.N. : Ain Zara, 1♂, 1♀ ; Gargaresc, 3♀ ; Tagiura, 1♀.

Les ♀, comme d'autres spécimens de Tripolitaine que j'avais déjà examinés, ont sur l' abdomen des dessins ferrugineux très développés. Le ♂ a le 1er tergite noir, les tergites 2 et 3 presque entièrement jaunes, les suivants noirs avec une bande terminale jaune.

Cerceris histrionica Klug

Tr.N. : Bugheilan, 1♂. Fe. : Brak, 2♂.

Cerceris albicincta Klug

Ti. : Zouar, 1♂ ; Enneri Meché, 1♀ ; Zouarké, 1♀.

Cerceris bupresticida Dufour

Tr.N. : Gargaresc, 1♂.

Le 1er tergite est noir ; des zones ferrugineuses à la limite des dessins noirs des tergites ; les parties foncées des pattes sont entièrement ferrugineuses. Ces caractères présentent une tendance vers la coloration particulière d'une ♀ que j'ai décrite de l'oasis de Siwa.

Cerceris tricolorata Spinola

Tr.N. : Bugheilan, 1♀. Ti. : Zouarké, 1♂.

Cerceris eugenia Schletterer

Ti. : Zouarké, 1♂.

La coloration claire est bien développée, comme chez les spécimens égyptiens, mais la ponctuation du thorax et du propodéum est espacée, comme chez ceux de Biskra.

Cerceris arenaria schulzi de Beaumont

Tr.N. : Near Garian, 1♂.

En présence d'un ♂ isolé, la détermination est un peu douteuse. Cet individu a 2 taches jaunes au collare ; son abdomen est tricolore, avec le 1er tergite ferrugineux et beaucoup de ferrugineux sur les tergites 2–4.

Cerceris rutila Spinola

Cy. : Cyrene, 1♀ ; Tolmeta, 1♂, 5♀ ; Derna, 1♀. Tr.N. : Tripoli, 1♀.

Les ♀ de Cyrénaïque ont le 1er tergite ferrugineux, des bandes ferrugineuses sur les tergites 2–4, le 5e étant noir ; elles sont donc semblables aux individus typiques d'Egypte. La ♀ de Tripoli a la tache du clypéus ferrugineuse, le 1er tergite entièrement ferrugineux, les tergites 2–4 avec une bande jaune, bordée de ferrugineux en avant, de petites tache jaunâtres sur le 5e tergite. C'est donc une forme de transition vers la race *lindeni* Lepeletier, d'Algérie et du Maroc.

Cerceris vittata Lepeletier

Tr.N. : Near Garian, 2♂.

J'ai déjà indiqué les difficultés que présente l'étude de la variation géographique chez cette espèce. Les 2 ♂ de Garian ont les angles du collare tout à fait arrondis ; la face n'est pas striée ; le lobe basal de l'aile postérieure est un peu plus long que le tiers de la cellule anale. La coloration ressemble à celle de *v. littorea* de Beaumont, mais le propodéum est noir.

Cerceris pharaonum Kohl

Ti. : Zouar, 1♂ : Dourzo, 1♂.

Ces individus, à collare échancré avec des angles aigus, ressemblent beaucoup aux ♂ de *pharaonum* d'Egypte, mais il serait nécessaire de voir des ♀ pour confirmer la détermination.

Cerceris teterrima Gribodo

Tr.N. : Leptis Magna, 4♂, 1♀ ; Giado, 1♂ ; Bugheilan, 1♂.

La ♀ a des zones d'un ferrugineux très sombre assez étendues sur la tête et le thorax. Le ♂ de Giado, celui de Bugheilan et un de ceux de Leptis Magna sont semblables à ceux de Tunisie. Chez les 3 autres ♂ de Leptis Magna, la coloration claire est plus développée ; il y a des taches, d'un jaune plus ou moins ferrugineux, sur le scutellum, le postscutellum, les mésopleures et le propodéum ; 1er tergite en grande partie ferrugineux ; l'aire dorsale du propodéum est un peu moins densément striée. Ces individus font peut être passage à *spinipectus* Smith.

Cerceris straminea Dufour

Tr.N.: Bugheilan, 1♀.

Cerceris solitaria Dahlbom

Ti. : Dourzo, 1♀.

Genre ***AMMATOMUS*** Costa

(Pour la classification générique des Nyssoninae, voir : de Beaumont 1954*b*)

Ammatomus mesostenus Handlirsch

Fe. : Brak, 1♂, 1♀.

Comme chez les individus de l'oasis de Siwa, les dessins sont d'un jaune blanchâtre, surtout chez la ♀ ; la ponctuation du dos du thorax est un peu moins dense.

Genre ***GORYTES*** Latreille

Gorytes (Hoplisoides) gazagnairei Handlirsch

Tr.N. : Near Garian, 1♂.

Gorytes (Dienoplus) laevis aegyptiacus Schulz (1904)

Fe. : Mourzouk, 1♂ ; Brak, 1♀.

Cette race a été basée sur un seul ♂, d'Egypte ; provenant de ce pays, j'ai examiné 2 ♂, qui correspondent très bien à la description de Schulz. En plus de la grande extension de la couleur rouge, ces individus se distinguent des *laevis* Latreille d'Europe par la présence de 2 taches blanches sur le 1er tergite et par la microponctuation moins développée sur le thorax et le 2e tergite, où les gros points sont un peu plus forts. Ces caractères de ponctuation, de même que la sculpture moins dense du thorax et du propodéum, la grande extension des dessins rouges, séparent ces spécimens de *formosus* Jurine. *G. pyrrhobasis* Morice se distingue par sa tête généralement plus foncée, l'aire dorsale du propodéum noire, la coloration rouge beaucoup plus étendue à la base de l'abdomen, l'absence de taches blanches sur le 1er tergite, le stigma d'un jaune très clair, les mésopleures moins ponctuées, la macroponctuation nettement plus fine.

Les 2 individus récoltés par M. Guichard, de même qu'une ♀ de Ghat (Bernard leg., Mus. Paris), ont une sculpture semblable à ceux d'Egypte ; les dessins blancs sont comme chez ceux-ci ; la couleur rouge est encore un peu plus étendue sur la tête, où seules la zone interocellaire et la partie inférieure des tempes sont noires ; les pattes sont presque entièrement rouges, de même que la base du 1er tergite.

Gorytes (Dienoplus) cyrenaicus n. sp.

Cy. : Derna, 17.iv.54, 1♂ type, 2♂ paratypes.

♂. Deux individus (dont le type) mesurent 5 mm. ; le 3e atteint 6,5 mm. Tête et thorax noirs ; extrémité des mandibules et une partie du funicule d'un ferrugineux sombre ; les 2 premiers tergites ferrugineux, le bord postérieur du 2e plus ou moins obscurci et montrant de chaque côté une tache blanche ; les tergites suivants noirs ; le 5e montrant chez le plus grand spécimen 2 très petites taches blanchâtres arrondies, peu visibles ; les 2 premiers sternites ferrugineux. Pattes noires ; les tibias 1 montrent à la face externe une petite et étroite strie jaune, n'atteignant pas l'extrémité ; une strie semblable existe sur les tibias 2 du plus grand spécimen. Ailes très peu enfumées, à nervures brunes.

La forme de la tête, vue de face, rappelle celle de *tumidus* Panzer ou *laevis* Latreille, c'est à dire avec le vertex relativement bombé ; le bord antérieur du clypéus, muni d'un rebord brillant très net, n'est pas régulièrement échancré, mais droit au milieu et saillant de chaque côté (fig. 11) ; la face montre la double ponctuation habituelle ; comparée à celle de *tumidus*, la macroponctuation est un peu plus forte, la microponctuation plus espacée, ce qui rend les téguments plus brillants ; sur le vertex et

sur les tempes, la microponctuation est à peu près nulle ; les 2e et 3e articles du funicule sont à peu près 2 fois aussi longs que larges, le 9e à peine échancré, le 12e à peine courbé ; POL : OOL = 2 : 1. Dos du thorax à microponctuation à peine visible, à macroponctuation plus forte que chez *tumidus* ; la macroponctuation des mésopleures est beaucoup plus forte et beaucoup plus dense que chez *tumidus* ; les sutures épisternale et épimérale sont complètement effacées. Les faces dorsale et postérieure du propodéum, de même longueur, forment entre elles un angle peu obtus ; l'aire dorsale est parcourue par un sillon médian profond à bords rectilignes ; elle est entièrement lisse ou montre quelques petites stries obliques dans ses angles antérieurs ; le reste de la surface du propodéum, à part quelques courtes cannelures perpendiculaires aux côtés de l'aire dorsale et quelques courtes stries horizontales

FIG. 17.—*Gorytes* (*Dienoplus*) *cyrenaicus* n. sp. Clypéus du ♂.

dans le haut des faces latérales, n'est pas strié, mais montre des points assez forts, espacés, sur fond brillant ou très subtilement microponctué. Le 1er tergite ne montre que quelques petits points ; sur le 2e tergite, la macroponctuation est plus forte que chez *tumidus*, tandis que la microponctuation n'est visible que dans la partie basale ; les tergites suivants sont plus brillants que chez *tumidus*, à ponctuation plus espacée. Epines des pattes très peu développées, moins longues que chez *tumidus*. La 3e cellule cubitale, assez large, a ses côtés parallèles ; le 3e segment de la radiale est plus long que le 4e.

Cette espèce est bien caractérisée par l'absence de dessins clairs sur la tête et le thorax, les pattes presque entièrement noires, la forme du clypéus, l'absence de sutures aux mésopleures, la ponctuation nette et espacée du propodéum. Par ce dernier caractère, de même que par la coloration du thorax et des pattes, elle se rapproche de *castor* Handlirsch, décrit d'Algérie et d'Egypte, et dont les types semblent malheureusement manquer au Muséum de Vienne ; *castor* a cependant les orbites et le clypéus jaunes, le 2e tergite sans taches blanches, la macroponctuation peu développée sur le thorax.

Gorytes (Dienoplus) delicatulus Morice (1911)

Fe. : El Manakh, 1♂, 2♀.

J'ai comparé ces spécimens à 1♂ et 1♀ paratypes, de Biskra (B.M.). On peut ajouter quelques compléments à la description originale. Quoi qu'en dise Morice, la sculpture n'est pas entièrement cachée par la pilosité. Il n'y a pas de macroponctuation sur la tête et le thorax ; le propodéum montre une aire dorsale peu striée, une face postérieure lisse et brillante ; l'abdomen est distinctement ponctué, en particulier sur le 2e tergite ; le dernier tergite de la ♀ est brillant, à ponctuation espacée. Le bord antérieur du clypéus ne montre pas de particularités ; il est

faiblement et régulièrement échancré, avec un rebord distinct ; lorsque la pilosité est arrachée, on remarque que les sutures des mésopleures sont très distinctes ; le sillon transversal, à la base du scutellum, est plus étroit que chez les autres espèces du groupe ; il est coupé de nombreuses petites stries. La cellule radiale est relativement peu aiguë à l'extrémité ; la 3e cellule cubitale est courte ; de ce fait, chez les 5 individus examinés, le 3e segment de la radiale est nettement plus court que le 4e.

Chez le ♂, la coloration noire est plus étendue sur la tête et le thorax que chez la ♀ ; le milieu de la face est noir depuis les insertions antennaires ; la couleur noire est plus développée sur le collare et les côtés du thorax. Sur l'abdomen, il n'y a pas de limite nette entre les couleurs. La nervulation, assez claire à la base de l'aile, devient un peu plus foncée à l'apex, mais le stigma est jaune clair.

Genre ***BEMBECINUS*** Costa

(Voir : de Beaumont 1954*d*)

Bembecinus mattheyi de Beaumont

Tr.N. : Garian Hills, 1♀ ; Azizia-Garian Rd., 1♂ ; near Garian, 1♂.

Genre ***STIZUS*** Latreille

Stizus pubescens Klug

Tr.N. : Garian, 1♂, 1♀. Fe. : Brak, 1♀.

Ces individus appartiennent à deux formes de coloration très différente, mais qui m'ont paru morphologiquement semblables ; j'admets, jusqu'à preuve du contraire, qu'elles représentent deux races géographiques de *pubescens*.

Le couple de Garian se rattache à la sous-espèce que j'ai décrite, sans la nommer, de l'oasis de Siwa (1950*b*) et dont j'ai vu depuis lors un ♂ de Cyrénaïque (Mus. Gênes). Il s'agit d'une race assez foncée, caractérisée par le fait que les dessins clairs ne sont pas jaunes, mais d'un ferrugineux plus ou moins jaunâtre.

La ♀ de Brak, par contre, a des dessins jaunes très étendus et se rapproche de *pubescens arenarum* Handlirsch (décrit de l'oasis de Mraier) ; elle est de coloration plus claire que les *arenarum* de Biskra ou de Marrakech ; elle est très semblable à deux autres ♀ que j'ai examinées, l'une provenant du Fezzan, sans précision (Mus. Gênes), l'autre d'El Golea (Mus. Paris). Voici la description de ces 3 individus.

La tête est jaune, un peu ferrugineuse en dessus des antennes et entre les ocelles et les yeux, avec une petite tache foncée entre les ocelles postérieurs. Pronotum jaune ; mésonotum jaune sur les côtés, sa partie centrale noire, avec une grande tache médiane et 2 taches latérales d'un ferrugineux foncé ; scutellum et postscutellum jaunes ; mésopleures jaunes ou avec une grande tache jaune ; métapleures jaunes dans le haut ; propodéum jaune, à l'exception d'une très étroite strie transversale noire à la base. Tergites jaunes, le 1er avec une tache à la base et un bord

postérieur ferrugineux sombre ou brunâtre, et une étroite strie médiane ferrugineuse, le 2e avec une bande apicale et une strie médiane semblables, les 3 suivants avec un triangle ferrugineux à la base ; sternites jaunes, plus ou moins tachés de ferrugineux au milieu. Pattes ferrugineuses et jaunes ; antennes ferrugineuses ; ailes presque hyalines, à peine plus foncées dans la cellule radiale.

Stizus fuliginosus Klug

Tr.N. : Gargaresc, 1♂, 3♀.

Stizus spinulosus Radoszkowsky

Tr.S. : Zella oasis, 1♂, 1♀.

Stizus savignyi Spinola (= *succineus* Klug)

Ti. : Zouarké, 2♂.

Stizus nadigi Roth (in Nadig 1933)

Ti. : Zouarké, 1♀.

Comme l'a noté Roth, cette espèce est bien caractérisée ; on peut encore signaler les particularités suivantes. Chez la ♀, la partie basale du clypéus est velue et densément ponctuée, tandis que la partie apicale est glabre, brillante, assez irrégulièrement ponctuée, avec quelques stries longitudinales ; la limite entre ces deux zones est plus nette que chez les espèces voisines ; de ce fait, le clypéus, vu de profil, apparaît assez nettement anguleux à mi-hauteur. Chez le ♂ également, la partie apicale du clypéus et le labre sont un peu plus brillants et plus fortement ponctués que d'habitude. Chez la ♀, les poils dressés de l'écusson facial et du clypéus sont très courts. Chez le ♂, les articles 5 à 8 des antennes présentent une nette carène sur toute la longueur de leur face inférieure ; la carène est plus courte sur les articles 9–12, représentée par un petit point sur l'article 13. Chez les espèces voisines, les carènes ne commencent que sur le 8e article et sont ici très courtes. L'aire pygidiale de la ♀ ne montre qu'une très fine pilosité, qui ne cache pas les téguments.

A part la tache apicale, plus ou moins foncée, mais toujours nette, les ailes de la ♀ sont tout à fait hyalines, celles du ♂ à peine enfumées (moins que chez *marthae* Handlirsch). L'extension des dessins jaunes sur le corps est variable. La ♀ du Fezzan a une coloration fondamentale jaune avec les dessins foncés suivants : une tache ferrugineuse au vertex, 3 stries longitudinales au mésonotum, les latérales noires et continues, la médiane se terminant avant le bord postérieur par une tache ferrugineuse triangulaire, une grande tache ferrugineuse au scutellum, une étroite bande transversale noire à la base du propodéum, une tache ferrugineuse à la base des tergites 1 et 2, une bande foncée, noire ou ferrugineuse, à l'extrémité des tergites 1–5, une tache sur le 6e, des dessins ferrugineux aux sternites.

J'ai examiné les types, provenant de Marrakech et quelques ♂ de Biskra ; au

Muséum de Paris, une ♀, en mauvais état, de Ahnet (Sahara central), appartient peut être à cette espèce.

Stizus fuscatus Morice (1897)

Fe. : El Manakh, 1♀.

Le ♂ de cette espèce présente une coloration très caractéristique ; les ailes sont fortement enfumées avec la bordure hyaline ; le corps et les pattes sont presque entièrement noirs ; les tergites médians montrent de chaque côté une petite tache d'un jaune blanchâtre ; ces taches peuvent exister sur les segments 2 à 5 ou se réduire, dans les cas extrêmes, au seul tergite 4 ; il est possible que, dans certains cas, elles disparaissent entièrement.

Les ♀ que j'associe à ces ♂ sont de coloration très différente. Le corps est noir avec les régions suivantes d'un ferrugineux sombre : une tache aux mandibules, la plus grande partie du clypéus et de l'écusson frontal, les côtés de la face, une bande à l'occiput, se prolongeant jusqu'au bas des tempes, le bord postérieur du collare, les côtés du mésonotum, les tegulae, le scutellum, de petites taches sur les côtés du postscutellum, parfois de petites taches sur les côtés du l'aire dorsale du propodéum, parfois une tache au 1er tergite. Antennes ferrugineuses, le scape et les derniers articles du funicule obscurcis en dessus ; pattes noires avec la plus grande partie des tibias et des tarses 1 et de petites taches aux tibias 2, ferrugineuses. Les ailes sont jaunâtres avec la bordure, en dehors des cellules, hyaline, et une tache brune très nette comprenant : la cellule radiale, la 3e cubitale, la plus grande partie de la 2e cubitale, l'extrémité de la 2e discoïdale et une petite zone entre celle-ci et la 3e cubitale ; la tache est donc plus développée que chez les espèces voisines.

Morphologiquement, cette espèce ne présente pas de caractères distinctifs très évidents ; on peut noter ceci : la ponctuation du clypéus devient moins serrée en avant, laissant quelques espaces plus grands que les points ; toute la partie médiane du scutellum, mate, à ponctuation extrêment fine et dense, est un peu déprimée ; postscutellum et propodéum très mats ; sur le 6e tergite, les soies, noires, sont denses, mais ne cachent pas complètement les téguments ; les épines du peigne sont un peu plus développées que chez les espèces voisines.

On pourrait être étonné que j'associe ces ♂ et ces ♀ qui présentent une coloration si différente de leurs ailes ; il faut cependant remarquer que si l'on considère comme foncées non seulement la tache apicale brune, mais aussi la partie jaune des ailes de la ♀, on arrive à une surface tout à fait semblable à celle qui est enfumée chez le ♂. Certains détails de sculpture rapprochent également ces individus. La légitimité de l'association résulte enfin du fait que j'ai capturé les deux sexes sur les mêmes fleurs.

L'espèce a été décrite d'Egypte d'après un unique ♂ que j'ai pu comparer à celui que j'ai déjà signalé du Maroc saharien (Imiter) ; c'est à cette espèce que se rapporte la ♀ (que j'ai examinée) citée par Rungs (1936) d'une autre localité du Maroc saharien (Kerrando) sous le nom de *S. saharae* Roth subsp. *flavipennis* Roth. J'ai d'autre part capturé un certain nombre d'exemplaires à Biskra.

La ♀ de la collection Guichard est épinglée avec sa proie : " 3d instar desert locust as prey."

Stizus niloticus Handlirsch

Fe. : In Aramas, 1♀ ; Brak, 3♂, 4♀. Ti. : Enneri Meché, 2♂.

Je reviendrai dans un autre travail sur cette espèce extrêment variable.

Stizus marthae Handlirsch

Fe. : Traghen, 1♀. Ti. : Zouarké, 2♀.

Je rappelle ici que le *Stizus marthae* de Mochi (1939*b*) n'a rien à voir avec l'espèce décrite sous ce nom par Handlirsch.

La race typique, décrite du sud de Biskra, est très claire ; les ♀, en particulier, sont souvent presque entièrement jaunes. La ♀ de Traghen se rattache à cette race typique, mais elle a le mésonotum un peu plus foncé que la ♀ la plus foncée que je possède de Biskra, c'est à dire qu'il présente 3 bandes longitudinales noires bien nettes, la médiane s'élargissant en triangle sans atteindre le bord postérieur.

J'ai déjà signalé que *cheops* Morice, d'Egypte, devait probablement être considéré comme race foncée de *marthae*. Les ♀ du Tibesti se rattachent à cette race, mais sont même plus foncées que celles d'Egypte. Les dessins de la tête, semblables à ceux de *cheops*, sont d'un ferrugineux-jaunâtre ; thorax noir avec des dessins clairs relativement peu développés, comprenant : la plus grande partie du prothorax, les côtés du mésonotum, de très petites taches aux mésopleures, le scutellum (sauf son bord antérieur chez l'un des individus), une strie au bord postérieur du postscutellum de très petites zones au propodéum ; ces dessins sont d'un ferrugineux-jaunâtre en avant, plus foncés en arrière. L'abdomen est différement coloré chez les 2 individus ; chez l'un d'eux, il ressemble à la ♀ la plus foncée que je possède de Siwa : 1er tergite un peu taché de ferrugineux à la base, le 2e avec 2 taches ferrugineuses, largement séparées au milieu, devenant jaunes tout à fait latéralement, le 3e tergite avec 2 taches jaunes, pointues à l'intérieur où elles sont largement séparées, le 4e tergite avec des taches latérales jaunes encore plus petites, le 5e avec des taches jaunes plus grandes, un peu ferrugineuses, se touchant presque au milieu, le 6e tergite ferrugineux. Chez la 2e ♀, le 1er tergite est largement ferrugineux à la base, le 2e avec une large bande basale ferrugineuse, étroitement interrompue au milieu, le 3e avec des taches de même forme que chez l'autre ♀, mais ferrugineuses, le 4e tergite est noir, le 5e avec des taches latérales jaunes et ferrugineuses, mal délimitées, le 6e ferrugineux à l'extrémité.

Genre ***BEMBIX*** Fabricius

Bembix galactina Dufour

Tr.N. : Garian, 1♀ ; Bugheilan, 1♀.

En l'absence de ♂, la détermination ne peut pas être considérée comme absolument certaine.

Bembix fischeri tibesti n. subsp.

Ti. : Dourzo, 11.iv.53, 1♀ type, 1♂ allotype, 3♀ paratypes ; Tao, 8.iii.53, 1♀ paratype ; Wadi Wour, 7.iii.53, 1♀ paratype.

Bembix fischeri Spinola est une espèce encore peu connue. Elle a été décrite d'après une unique ♀ égyptienne que j'ai examinée (Mus. Turin). Des deux ♀ signalées par Handlirsch sous ce nom, l'une en tous cas (Mus. Vienne) appartient à une autre espèce. M. D. B. Baker m'a fait remarquer que c'est le ♂ de *fischeri* que Morice a décrit (1897) sous le nom de *B. nasuta* ; j'ai étudié ce type (Mus. Oxford), ainsi qu'un autre ♂ d'Egypte (B.M.).

Par ses caractères généraux, par la forte spinulation du dernier tergite de la ♀ et diverses particularités des derniers segments et de l'armature génitale du ♂, l'espèce est voisine de *sinuata* Latreille, dans le groupe duquel elle doit se placer ; elle semble également proche de *brunneri* Handlirsch.

Laissant pour un autre travail la description détaillée de *fischeri*, je note ici que le ♂ du Tibesti se distingue morphologiquement de ceux d'Egypte par la plateforme triangulaire du 6e sternite plus nettement soulevée (mais pas plus nettement limitée) et par la volsella de l'armature génitale en triangle plus étroit et plus allongé. A ces particularités morphologiques s'ajoutent des caractères chromatiques et je donne ci-dessous la description de la coloration chez la sous-espèce.

♀. Sont jaunes sur la tête et le thorax : les mandibules (sauf leur pointe), le labre, le clypéus, de larges bandes orbitaires, une bande médiane sur la face, atteignant l'ocelle antérieur, 2 taches sous ce dernier, une grande partie des tempes, le prothorax, les côtés du mésonotum, la plus grande partie du scutellum et du post-scutellum, souvent de petites taches aux méso- et aux métapleures, une grande partie du propodéum. La face dorsale de l'abdomen est jaune ; la base déclive du 1er tergite, prolongée sur la base de la face dorsale par 2 taches arrondies, est noire ; le bord postérieur des tergites est ferrugineux, le 6e entièrement de cette couleur ; le disque du 2e tergite montre 2 petites taches libres, ferrugineuses, peu apparentes ; sur le 3e tergite, ces taches, centrées de noirâtre, sont plus nettes ; sur le 4e, elles sont reliées à l'étroite bande basale foncée ; sternites ferrugineux, plus ou moins tachés de noir, avec de grandes taches jaunes sur les côtés, du 2e au 5e. Scapes jaunes, funicules ferrugineux à la base, obscurcis à l'extrémité ; fémurs ferrugineux, ceux de la 1ère paire tachés de noir à la base ; tibias et tarses jaunes. ♂. Comme la ♀ ; les fémurs en grande partie jaunes.

Bembix dahlbomi Handlirsch

Tr.S. : Hon, 1♀. Fe. : Brak, 7♀.

Bembix olivacea saharae Giner Mari

Ti. : Wadi Wour, 1♀ ; Zouar, 2♀ ; Bardai-Zouar Rd., 3♀ ; Guelta Morso, 1♀.

Bembix radoszkowskyi Handlirsch

Tr.N. : Gargaresc, 1♂. Ti. : Wadi Wour, 1♂.

Bembix oculata Latreille

Tr.N. : Bugheilan, 1♀.

Comme c'est généralement le cas chez les ♀ nord-africaines, la face et le clypéus, sauf une étroite bande terminale ferrugineuse, sont noirs ; labre d'un jaune ferru-

gineux. Le thorax et l'abdomen sont beaucoup plus tachés de jaune que chez la race *ceballosi* Giner Mari, du Maroc, ou de la race encore plus foncée que j'ai décrite de Siwa et qui habite aussi le Sahara central.

Bembix turca Handlirsch

Tr.N. : Gargaresc, 3♂, 4♀ ; Leptis Magna, 2♂ ; Tagiura, 3♂, 1♀.

J'ai déjà signalé (1953*a*) qu'une série de formes décrites comme espèces distinctes sont en fait des races géographiques d'une espèce circumméditerranéenne, dont le nom le plus ancien est *turca* Dahlbom. Alors qu'en Algérie d'une part, en Palestine d'autre part, on trouve des races fortement tachées de jaune, les individus de la zone intermédiaire, entre le Tunisie (Sfax, Ile Djerba) et l'Egypte (Alexandrie) ont l'abdomen généralement entièrement noir et les pattes très foncées ; ils ressemblent donc à la race typique, décrite de l'île de Rhodes.

Bembix frey-gessneri Morice (1897)

Fe. : Oum el Araneb, 1♂.

Cette espèce est voisine de la précédente ; elle s'en distingue entre autres par la taille plus faible, le clypéus (surtout chez la ♀) proportionellement plus large, les crochets du pénis très fortement dilatés avant l'apex. Il me semble que c'est cette espèce qui a été décrite de Sokotra sous le nom de *dissimilis* par Kirby (voir Kohl 1906).

Genre ***ASTATA*** Latreille

Astata boops Schrank

Cy. : Derna, 1♂ ; Wadi Mara, 1♀.

Genre ***LIRIS*** Fabricius

(Voir : Richards 1928.)

Liris haemorrhoidalis Fabricius

Tr.S. : Hon oasis, 3♂, 2♀. Fe. : Mendil, 1♂ ; Brak, 1♂. Ti. : Bardai, 1♀.

Liris memnonia Smith

Tr.N. : Sidi Mesri, 1♀. Tr.S. : Hon oasis, 2♂, 2♀ ; Meduin oasis, 2♀. Fe. : Brak, 1♀.

Liris atrata Spinola (=*nigrita* Lepeletier).

Tr.N. : Sidi Mesri, 1♂, 1♀ ; Gargaresc, 1♀ ; Gioda, 1♀. Tr.S. : Hon oasis, 11♂, 3♀ ; Zella oasis, 6♂, 1♀ ; Hon. 1♂, 2♀. Fe. : In Aramas, 1♀. Ti. : Dourzo, 1♀.

Liris nigra van der Linden (=*pompiliformis* auct.)

Cy. : Barce, 1♀.

Liris nigricans Walker

Cy. : Ras el Hilal, 1♀. Tr. N.: Tripoli, 1♀. Tr.S. : Meduin oasis, 1♀. Fe. : Traghen, 1♀. Ti. : Zouar, 1♀.

Genre ***TACHYTES*** Fabricius

Tachytes patrizii Guiglia (1932, 1939)

Fe. : Brak, 4♂, 4♀.

Tachytes maculicornis Saunders

Tr.N. : Garian, 1♀. Fe. : Brak, 2♀.

Tachytes frey-gessneri Kohl

Tr.N. : Garian, 1♂ ; Bugheilan, 2♂, 1♀.

Genre ***TACHYSPHEX*** Kohl

Voir : de Beaumont 1947*c*, 1955.)

Tachysphex panzeri van der Linden

Tr.N. : Ain Zara, 1♂ ; Cussabat, 1♂ ; Azizia district, 18♀ ; Garian, 1♀ ; near Garian, 1♀. Fe. : Mourzouk, 3♂ ; Oum el Araneb, 1♂, 1♀ ; Brak, 1♂.

Au Maroc, on rencontre 4 formes distinctes que l'on peut provisoirement rattacher à cette espèce (de Beaumont 1955) ; je n'ai pas vn assez de spécimens pour préciser les conditions dans les régions faisant l'objet de ce travail. Les 18 ♀ d'Azizia et celle de Garian sont de taille et de coloration très homogènes ; par le clypéus, le 6e tergite et les pattes rouges, par la présence de bandes de pruinosité aux 3 premiers tergites seulement, elles se rapprochent de *p. oraniensis* Lepeletier, mais elles ont les segments 4 et 5 noirs. La ♀ " near Garian " se rattache plutôt à *p. panzeri*. Les spécimens du Fezzan appartiennent au type que j'ai nommé la forme saharienne.

Les individus d'Azizia portent une étiquette de la main de M. Guichard : " 18 Tachysphex preying on 4th instar of Schistocerca gregaria. Never seen a Tachysphex so common."

Tachysphex buyssoni Morice

Ti. : Enneri Meché, 1♂.

Tachysphex micans Radoszkowsky

Fe. : Mourzouk, 1♂.

Tachysphex gracilicornis Mercet

Tr.N. : Garian Hills, 1♀.

Tachysphex brevipecten de Beaumont (1955)

Tr.N. : Tagiura, 1♂.

Tachysphex luxuriosus Morice

Tr.N. : Garian, 1♀.

Tachysphex horus de Beaumont

Fe. : Oum el Araneb, 1♂.

Tachysphex erythropus Spinola (=*mantivorus* de Beaumont)

Tr.N. : Corradini, 1♂ ; Garian, 1♂ ; Bir el Hamera, 1♂, 1♀.

Tachysphex costai Destefani

Tr.N. : Garian, 2♂.

Tachysphex albocinctus Lucas

Tr.N. : Gargaresc, 2♂ ; Tagiura, 2♂ ; Garian, 1♂.

Tachysphex schmiedeknechti Kohl

Fe. : Mendil, 1♂ ; Mourzouk, 1♂.

Tachysphex julliani Kohl

Tr.N.: Giado, 2♂.

Ces ♂ se rattachent à la forme que j'ai nommée No. 1.

Tachysphex foucauldi de Beaumont

Ti. : Tao, 1♀.

Cette ♀ doit très probablement être associée au ♂ que j'ai décrit du Hoggar (1952*c*). En voici la description.

Taille : 10 mm. Coloration comme chez le ♂ ; pilosité de la face argentée ; des bandes de pruinosité sur les 4 premiers tergites.

FIGS. 18–19.—*Tachysphex foucauldi* de Beaumont ♀. (18) Clypéus. (19) Aire pygidiale.

Palpes maxillaires comme chez le ♂ ; clypéus avec une aire apicale brillante peu développée, en triangle aplati ; la lamelle forme au milieu un angle très obtus ; elle montre de chaque côté une dent avant l'angle latéral, lui même dentiforme (fig. 18) ; le 2e article du funicule est 3 fois aussi long que large, un peu plus court que le 3e ; face à ponctuation fine et dense, avec des espaces linéaires, brillants, entre les points ;

vertex à ponctuation à peine plus espacée ; la distance interoculaire est un peu plus courte que le 2e article du funicule ; sculpture du thorax comme chez le ♂ ; aire pygidiale à partie basale large, brillante, avec quelques points très espacés ; sa partie postérieure, rétrécie, est finement striolée (fig. 19).

Comme le ♂, la ♀ ressemble au premier abord aux espèces du groupe d'*erythropus*, mais la structure des palpes et de l'aire pygidiale, l'absence de carène aiguë au 1er sternite, la placent nettement dans le groupe de *julliani* ; elle se distingue d'*abjectus* Kohl et des formes noires de *julliani* par les dents latérales du clypéus, l'aire pygidiale moins large, les pattes rouges jusqu'à la base des fémurs.

Tachysphex vestitus Kohl

Tr.N. : Bir el Hamera, 3♂, 1♀.

Tachysphex adjunctus Kohl

Tr.N. : Azizia-Garian Rd., 1♂.

Tachysphex cyrenaicus de Beaumont

Cy. : Cyrene, 2♂, 1♀ ; Ras el Hilal, 1♂.

J'ai décrit cette espèce d'après une seule ♀ de Cyrénaïque ; depuis lors, j'ai vu (coll. von Schulthess) 2 ♀ de la même provenance ; celle de la collection Guichard est semblable ; on peut cependant noter une certaine variation dans la densité de la ponctuation de la face. Voici la description du ♂.

Taille : 8 mm. Coloration et pilosité comme chez la ♀. Le clypéus montre une partie médiane rétrécie en avant avec une petite aire apicale brillante et une lamelle à bord antérieur arqué ; la ponctuation de la face est fine et très dense, sans espaces entre les points chez les deux individus de Cyrene ; elle est un peu plus espacée chez le 3e ; vertex brillant, avec une ponctuation fine et des espaces nettement plus grands que les points ; la distance interoculaire égale la longueur des 3 premiers articles du funicule. Mésonotum brillant, montrant comme d'habitude dans ce groupe une ponctuation beaucoup plus dense que chez la ♀ ; ce n'est que dans la partie postérieure qu'il y a des espaces plus grands que les points ; la ponctuation est cependant moins dense que chez *bicolor* Brullé. Comme chez *latifrons* Kohl, les fémurs 1 montrent une échancrure beaucoup plus profonde que chez *bicolor* ; leur face externe montre une ponctuation espacée. L'armature génitale ressemble beaucoup à celle de *latifrons*, telle que je l'ai figurée (1947*b*) ; les soies de la volselle sont un peu moins sinueuses à l'extrémité.

Tachysphex denisi de Beaumont

Cy. : Ras el Hilal, 2♂, 3♀ ; Derna, 1♂. Tr.N. : Homs, 1♀.

Ces individus présentent les mêmes caractères que ceux que j'ai décrits du Maroc (1955).

Tachysphex nitidus Spinola

Cy. : Ras el Hilal, 1♀ ; Derna, 1♂. Tr.N. : Sabratha, 2♀ ; Tripoli, 2♀ ; Sidi Bennur, 2♂, 1♀ ; Corradini, 1♀ ; Zliten, 1♂ ; Gioda, 1♂, 1♀ ; Garian, 2♀ Tr.S. : Hon oasis, 1♂ ; Jebel Soda, 1♂, 1♀ ; Hon, 1♀. Fe. : Mourzouk, 1♀ ; El Manakh, 1♀.

Ces *nitidus* se rattachent assez nettement à 2 types distincts. Le ♂ et la ♀ de Cyrénaïque et la ♀ de Corradini sont semblables aux individus de l'Afrique du N-W à mésopleures densément ponctuées. Tous les autres individus ressemblent à ceux d'Egypte que j'ai eu l'occasion d'examiner ; comme je l'ai déjà signalé, ceux-ci ont la pilosité nettement plus longue. On peut noter encore qu'ils sont de taille relativement grande, qu'ils ont les tempes relativement peu développées et le vertex nettement concave. Pour les autres caractères : clypéus des 2 sexes, striation longitudinale assez nette de la face dorsale du propodéum, structure des volselles et des crochets de l'armature génitale, ce sont bien des *nitidus*.

Tachysphex tarsinus Lepeletier

Fe. : Mourzouk, 2♂, 1♀ ; Oum el Araneb, 1♀ ; Brak, 1♂, 2♀.

Comme chez d'autres spécimens nord-africains examinés, la taille est relativement faible et l'appendice dorsal de la volsella est moins large et plus élevé que chez les individus d'Europe ; les soies fortes et peu nombreuses de la volselle restent caractéristiques. Ces *tarsinus* du Fezzan ressemblent à des exemplaires égyptiens que j'ai étudiés ; ils ont la ponctuation des mésopleures moins dense, celle de la face plus dense que chez ceux de l'Afrique du N. W. et d'Europe.

Tachysphex cabrerai Mercet

Tr.N. : Gargaresc, 1♀ ; Tagiura, 1♀ ; Giado, 1♂, Jefren, 1♀.

Tachysphex pusulosus de Beaumont (1955)

Tr.N. : Corradini, 1♀ type.

Tachysphex priesneri de Beaumont

Tr.S. : Hon oasis, 13♂ ; Zella oasis, 10♂, 2♀. Fe. : Mendil, 1♂, 2♀ ; Mourzouk, 1♀.

Ces ♂ présentent une grande variation de certains caractères. Comme chez les individus déjà décrits, le bord antérieur du clypéus peut former un angle net, mais obtus ; c'est le cas chez tous les individus de Hon et chez deux de ceux de Zella ; chez les autres, la pointe du clypéus est beaucoup plus aiguë. Les mésopleures peuvent être mates dans toute leur partie supérieure, sans ponctuation distincte ; c'est la sculpture que l'on voit chez les spécimens à clypéus relativement obtus, mais aussi chez certains de ceux qui ont le clypéus à pointe aiguë ; chez les autres exemplaires, les mésopleures sont beaucoup plus brillantes, avec une ponctuation espacée, assez nette par endroits. La taille varie de 5 à 9 mm., sans liaison avec les caractères précédents. Chez les petits spécimens, les faces latérales du propodéum ne sont pas striées. On observe aussi une certaine variation dans la forme de la volsella, mais pas plus étendue que chez d'autres espèces.

Genre *PROSOPIGASTRA* Costa

(Voir : de Beaumont 1954*c*.)

Prosopigastra (s.s.) punctatissima africana de Beaumont (1955)

Tr.N. : Bugheilan, 1♀.

Prosopigastra (s.s.) handlirschi Morice

Tr.N. : Sabratha, 4♂, 1♀ ; Azizia-Garian Rd., 1♀.

Prosopigastra (s.s.) zalinda de Beaumont (1955)

Tr.N. : Sidi Gelani, 2♂ ; near Garian, 1♂, 1♀ ; Bir el Hamera, 1♂, 1♀.

Prosopigastra (s.s.) minima n. sp.

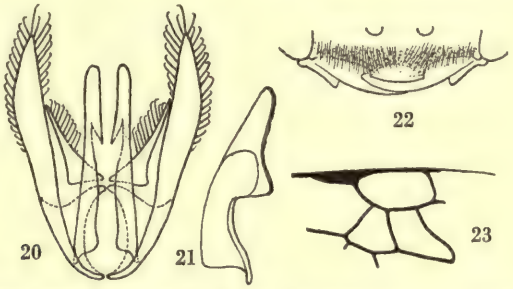
Ti. : Wadi Wour, 7.iii.53, 1♂ type. Egypte : W. Shagra, 24.iv.33, 1♂ paratype (coll.mea).

♂. 5 mm. Tête et thorax noirs ; mandibules ferrugineuses à base noire ; abdomen ferrugineux, les dépressions terminales des tergites jaunâtres ; chez le type, 2 taches sur la base verticale du 1er tergite et la base du 4e tergite sont noirâtres ; chez le paratype, la couleur noirâtre s'étend aussi sur une partie des tergites 2–6 ; une petite tache à l'extrémité des fémurs, les tibias et les tarses ferrugineux ; les tibias 1 et 2 peu rembrunis ; tegulae et nervulation jaunâtres ; ailes hyalines.

Une pilosité argentée couchée dense cache la sculpture sur le clypéus (sauf son aire apicale), les côtés de la face et la zone comprise entre les tubercules facial et ocellaire ; pilosité très peu développée sur le thorax, sauf sur le postscutellum et les faces latérales du propodéum ; pruinosité peu développée sur l'abdomen.

L'aire apicale brillante du clypéus montre un ou deux très petits points ; son bord antérieur, limité de chaque côté par un angle net, est très faiblement arqué ou en angle très obtus (fig. 22) ; articles basaux du funicule non dilatés sur leur face postérieure ; le 2e et le 3e de même longueur, 2 fois aussi longs que larges ; tubercule facial à sillon médian à peine indiqué chez le type, plus net chez le paratype ; tubercule ocellaire très brillant et à peine ponctué ; vertex avec un étroit sillon médian et une ponctuation dense, les espaces, brillants, plus petits que les points ; la distance interoculaire égale presque la longueur des articles 2 et 3 du funicule réunis ; vue par dessus, la tête est rétrécie immédiatement derrière les yeux ; tempes très brillantes, avec quelques points épars. Mésonotum très brillant, avec quelques points épars ; ce n'est que dans sa partie tout à fait antérieure que la ponctuation devient un peu plus dense ; scutellum très peu ponctué aussi ; postscutellum à ponctuation fine et dense ; épisternes mésothoraciques lisses et brillants dans le haut, peu ponctués dans le bas ; épimères lisses et brillants, avec quelques très petits points ; le reste de la surface des mésopleures avec de très gros points assez serrés ; le mésosternum ne présente pas de tubercules médians ; en arrière, il est tronqué avant les hanches 2, mais sans former de saillie ou d'épine à cet endroit ;

face dorsale du propodéum sans aire médiane nettement limitée, brillante, avec une réticulation relativement fine ; faces latérales striées. Tergites à ponctuation fine et pas très dense, les espaces presque partout plus grands que les points ; sternites très peu saillants en bourrelet à l'extrémité, les avant-derniers sans dense pilosité, le 8e avec des poils denses, fortement courbés en arrière. La figure 20 montre l'ensemble de l'armature génitale (les soies sont en réalité plus nombreuses), la figure 21 présente un des crochets du pénis ; ces dessins ont été faits d'après l'armature du



FIGS. 20–23.—*Prosopigastra minima* n. sp. ♂. (20) Armature génitale. (21) Crochet du pénis. (22) Clypéus. (23) Fragment de l'aile.

paratype, mais celle du type a été contrôlée. Cellule radiale très courte (fig. 23), comme chez certaines espèces du sous-genre *Homogambrus* Kohl.

Prosopigastra minima se distingue des autres espèces du sous-genre par sa petite taille, sa ponctuation espacée, sa cellule radiale très courte ; c'est de *P. zalinda* de Beaumont qu'elle est la plus voisine, mais l'absence presque complète de ponctuation sur le haut des mésopleures, la ponctuation moins dense de toutes les autres parties du corps, l'absence de tubercules médians sur le mésosternum, les ailes hyalines avec la nervulation plus pâle et la cellule radiale plus courte, la pilosité plus dense du 8e sternite, les crochets de l'armature de forme différente, la distinguent nettement. L'aspect de la tête, vue de face, avec les deux tubercules très brillants, séparés par une zone de pilosité argentée dense, est bien caractéristique.

Genre ***PARAPIAGETIA*** Kohl

Parapiagetia odontosoma Kohl

Ti. : Enneri Kudi, 1♂.

Parapiagetia zorah de Beaumont (1955)

Ti. : Bardai, 1♂.

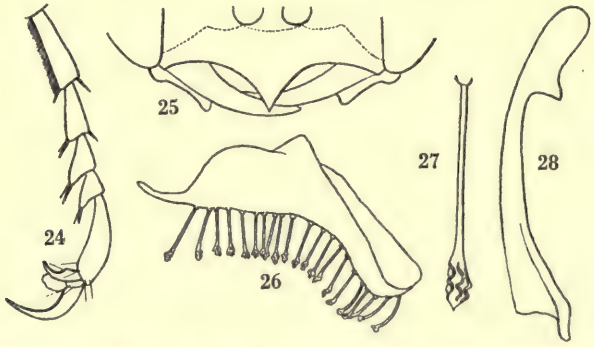
Parapiagetia saharica n. sp.

Fe. : Brak, 9.v.52, 1♂ type, 1♂ paratype.

♂. 6–6,5 mm. Noir. Sont ferrugineux : les mandibules, une tache à l'extrémité des scapes, la plus grande partie du 1er tergite, les côtés du 2e, l'extrémité du 7e,

une partie du 1er sternite, le 2e, l'extrémité des fémurs, les tibias, les tarses, les tegulae et la nervulation ; ailes très légèrement teintées.

Tête, vue de face, un peu plus large que haute (à peu près 5 : 4) avec les yeux peu convergents vers le haut ; mandibules nettement échancrées au bord inférieur ; lobe médian du clypéus saillant en une pointe très aiguë (fig. 25) ; 2e article du funicule à peine plus long que large à l'extrémité, le 3e article 1,5 fois aussi long que large ; face avec une ligne enfoncée médiane et une ponctuation assez serrée, mais presque entièrement cachée par une pilosité argentée dense, assez longue ; vertex très brillant avec de petits points très espacés ; tubercle ocellaire fortement bombé, avec un sillon longitudinal à peine indiqué ; les ocelles postérieurs sont de même forme que chez *Tachysphex*, mais très peu nettement limités ; une impression angulaire très nette sur le vertex ; la distance interoculaire est grande, égalant la



FIGS. 24–28.—*Parapiagetia saharica* n. sp. ♂. (24) Tarses 3, face interne. (25) Clypéus (sans la pilosité). (26) Volsella. (27) Soie de la volsella. (28) Crochet du pénis.

longueur des 4 premiers articles des tarses 1 ; tempes brillantes, avec une pilosité argentée assez développée. Thorax très brillant ; propleures avec quelques stries verticales ; le mésonotum ne montre sur le disque que quelques rares points ; sur les côtés et en arrière, la ponctuation est un peu plus dense ; sur le haut des mésopleures, la ponctuation, très fine, est assez dense, mais cependant avec des espaces plus grands que les points ; partie inférieure des mésopleures sans points ; scutellum et postscutellum à points très espacés. Propodéum brillant ; sa face dorsale avec quelques stries transversales, rectilignes, fines et peu accentuées ; sur les côtés de la face dorsale, la striation s'arrête, remplacée là par une ponctuation espacée ; faces latérales du propodéum à striation oblique ; face postérieure, très oblique, avec une fossette longitudinale très développée et une ponctuation espacée ; les points du thorax et du propodéum donnent naissance à des poils argentés dressés assez longs, surtout denses sur le haut des mésopleures. L'abdomen est longuement fusiforme, plus ramassé que chez *P. odontosoma* Kohl, mais plus allongé que chez les *Tachysphex*, à peu près 3 fois aussi long que large ; vu par la face dorsale, le 1er tergite montre des côtés à peu près droits ; il est un peu plus long que large à l'extrémité (6 : 5) ; ses côtés rabattus se rapprochent beaucoup l'un de l'autre

sur la face ventrale ; tergites avec une microsculpture et une pruinosité très fines ; le bord postérieur, décoloré, des tergites 2–6 est à peine déprimé, limité à la base en ligne droite ; sur les sternites 2–5, au contraire, la dépression terminale est très fortement élargie au milieu ; le 7e tergite, aplati, densément ponctué, forme une sorte de très petite aire pygidiale ; le bord postérieur du 8e sternite est régulièrement arrondi. Hanches antérieures fortement transversales ; métatarse 1 avec 4–5 épines au bord externe, à peine plus courtes que la largeur de l'article ; griffes 1 légèrement asymétriques ; aux pattes 2 et 3, les fémurs et tibias sont courts ; le fémur 2, par exemple, est 2,5 fois aussi long que large ; métatarses 2 et 3 sans autres épines que les apicales ; le dernier article des tarses 2 et 3 est fortement arqué, allongé, plus long que le 1er, avec les griffes très fortement asymétriques, l'externe étant beaucoup plus longue que l'interne (fig. 24). Aux ailes antérieures, la cellule radiale est étroitement tronquée à l'extrémité et la 3e cubitale fortement étirée, à peu près comme chez *Tachysphex costai* Destefani ; le nervulus n'est que peu antéfurcal, de moins que sa propre longueur.

L'armature génitale, dans l'ensemble, rappelle celle des *Tachysphex*, en particulier pas sa forme comprimée. La volsella est munie de soies (plus nombreuses que sur le dessin) curieusement élargies à l'extrémité (fig. 26 et 27) ; les crochets (fig. 28), brusquement élargis à l'extrémité, rappellent ceux des *Tachysphex* du groupe d'*albocinctus* ou des *Prosopigastra*.

Cette espèce fait partie d'un groupe dans lequel se placent *capensis* Brauns, de l'Afrique du Sud, *longicornis* Arnold et probablement *pluridentata* Arnold de Madagascar. Ces espèces se distinguent entre autres de *P. odontosoma* (type du genre) et des formes voisines par leur abdomen moins allongé, les pattes plus courtes avec les griffes du ♂ très asymétriques, les ocelles postérieurs encore moins distincts, la cellule radiale peu tronquée, l'aire pygidiale de la ♀ recouverte de soies isolées. Il existe en Afrique du Nord plusieurs espèces inédites appartenant à ce groupe ; ainsi, j'ai dans ma collection un ♂ d'Egypte, très voisin de *saharica*, mais de taille un peu plus grande, à pilosité plus développée et à fémurs en grande partie rouges ; je possède aussi, de Biskra et de Tripolitaine, 2 ♀, différentes par l'armature du bord antérieur du clypéus, ayant les pattes et l'abdomen presque entièrement rouges, et qui me semblent trop grandes pour être associées aux ♂ de *saharica*.

Genre ***GASTROSERICUS*** Spinola

Gastrosericus waltlii Spinola

Tr.N. : Gargaresc, 1♂ ; Tagiura, 2♂ ; Garian, 1♀. Ti. : Enneri Kudi, 1♀. L'abdomen est noir chez les 2 sexes.

Gastrosericus guigliae n. sp.

Tr.N. : Garian, 24.vi.51, 1♀ type. Egypte : Wadi el Tih, 14.vi.35, 1♀ paratype (H. Priesner leg., coll.mea).

♀. 7–8,5 mm. Tête et thorax noirs avec les parties suivantes de couleur jaune ; les mandibules (sauf leur pointe), le clypéus (son bord antérieur ferrugineux), les

scapes, les tubercules huméraux et une tache sur les tegulae ; la couleur jaune du clypéus apparaît sous la pilosité argentée. Abdomen et pattes ferrugineux ; l'extrémité des fémurs et la face externe des tibias, jaune ; funicule ferrugineux à la base ; ailes hyalines avec les nervures d'un ferrugineux pâle.

Clypéus et bas de la face recouverts d'une pilosité argentée couchée, très dense, très brillante, un peu plus courte et plus appliquée que chez *waltlii* Spinola ; plus haut sur la face, la pilosité reste dense, cachant la sculpture, mais elle est moins appliquée sur les téguments, formant une sorte de rosette à poils divergeant d'un centre situé en avant de l'ocelle antérieur ; pilosité peu développée sur le vertex ; les tempes sont aussi couvertes, sauf dans leur partie inférieure brillante, d'une pilosité couchée assez dense. Sur le thorax, la pilosité, plus ou moins jaunâtre sur le dos, est un peu hérissée ; elle est assez dense, chez un individu tout à fait frais, pour cacher les téguments ; sur le propodéum, elle est d'aspect un peu laineux, nettement plus courte que chez *waltlii*. Face dorsale de l'abdomen avec une pilosité argentée couchée assez dense, formant des bandes à l'extrémité des tergites 1–5 ; aire pygidiale avec des soies couchées comme chez *waltlii*. Les hanches, trochanters et fémurs sont également revêtus de pilosité argentée, généralement couchée ; elle est cependant dressée sur les fémurs 1.

L'espèce ressemble à *waltlii* et à *drewseni* Dahlbom par la forme générale de la tête, les antennes, l'aire pygidiale, la spinulation des pattes, la nervulation. Elle s'en distingue par le clypéus légèrement bombé sur toute sa surface et la ponctuation du vertex beaucoup plus fine et plus dense ; la ponctuation du reste de la tête et du thorax est peu visible, mais semble aussi plus dense que chez *waltlii*. Le bord antérieur du clypéus forme au milieu un angle plus saillant que chez *waltlii*, à peu près comme chez *drewseni*.

Cette espèce est colorée exactement comme *moricei* Saunders, mais ce dernier a la pilosité de tout le corps beaucoup plus courte, ne laissant pas libre le bas des tempes, l'apex du clypéus peu proéminent, un peu déprimé, les épines du peigne plus courtes, la cellule radiale plus courte, la taille plus faible. Elle est plus voisine de *drewseni* (elle même très proche de *waltlii*), mais s'en distingue, outre les caractères indiqués ci-dessus, par la pilosité moins hérissée, les fémurs rouges, le clypéus et les scapes jaunes.

Je dédie cette espèce à Mademoiselle D. Guiglia, Dr ès sciences, du Musée de Gênes, en hommage à ses nombreux travaux entomologiques et en particulier à ceux qu'elle a consacrés à la faune libyenne.

Genre ***PALARUS*** Latreille

(Voir : de Beaumont 1949*b*.)

Palarus histrio Spinola

Fe. : In Aramas, 1♂.

Palarus hastatifrons africanus de Beaumont

Tr.N. : Gargaresc, 1♂ ; Garian, 1♀.

Genre *MISCOPHUS* Jurine

Les espèces de ce genre ont été étudiées par M. N. F. de Andrade, qui a publié récemment (1954) un travail à ce sujet.

Miscophus ctenopus Kohl

Tr.N. : Jefren, 1♀.

Miscophus papyrus de Andrade

Fe. : Mendil, 1♀ paratype.

Miscophus tagiurae de Andrade

Tr.N. : Tagiura, 1♀ type, 1♀ paratype ; Gargaresc, 1♀ paratype.

Miscophus imitans Giner Mari

Fe. : Mendil, 1♀ ; Mourzouk, 1♂.

Miscophus deserti Berland

Tr.S. : Hon oasis, 1♂, 1♀ ; Jebel Soda, 1♀ ; Hon, 1♂, 1♀. Fe. : Mendil, 3♂, 1♀ ; In Aramas, 1♀.

Genre *SOLIERELLA* Spinola

Je connais une série d'espèces inédites de ce genre, qui mériterait d'être révisé. En Afrique du Nord, on a signalé *aegyptiaca* Kohl, d'Egypte, *canariensis* Saunders, de Ténérife et *compedita* Piccioli, d'Algérie ; j'ai vu des exemplaires de cette dernière espèce provenant du Maroc, et je décrirai prochainement 2 espèces nouvelles de ce pays. *S. compedita* et *aegyptiaca* se distinguent des espèces décrites ci-dessous par leur taille plus grande et une série de caractères de sculpture et de coloration. *S. canariensis* n'a pas de dessins jaunes, comme *obscura* n. sp., mais la description montre qu'il doit s'agir d'une autre espèce.

L'étude de ce matériel, de petite taille, a été faite à un grossissement de × 75.

Solierella guichardi n. sp.

Tr.N. : Gargaresc, 23.v.52, 1♂ type.

♂. 3 mm. Mandibules jaunâtres à pointe ferrugineuse. Les dessins du corps sont d'un jaune moins blanchâtre que chez les autres espèces, plus ou moins ferrugineux, mais celà pourrait être dû à une transformation post mortem. Sont jaunes : une bande continue au collare, une petite tache aux tubercules huméraux, le postscutellum, une tache à l'extrémité des fémurs 1, les tibias et les tarses. Tegulae ferrugineuses, les nervures d'un brun assez foncé.

Mandibules sans dent à leur bord inférieur ; partie médiane du clypéus sans carène longitudinale, brillante, avec quelques points, terminée en avant par une

pointe très aiguë ; antennes de 12 articles ; le 2e article du funicule de la longueur du 1er, à peine plus long que large à l'extrémité ; les articles suivants plus longs, le 4e à peu près 2 fois aussi long que large ; les avant-derniers articles de nouveau plus courts, le dernier aussi long que le précédent, régulièrement rétréci (fig. 29) ; tête brillante, mais avec une microsculpture visible à × 25 ; sur la face, la ponctuation est assez dense dans le bas, devenant espacée dans le haut, avec des espaces plus grands que les points ; les points sont plus petits et plus espacés entre les ocelles et en arrière de ceux-ci ; ils manquent à peu près entre les ocelles et les yeux. POL : OOL = à peu près 2 : 1 ; OOL = le diamètre d'un ocelle. Mésonotum brillant, avec une microsculpture bien visible à × 25 ; sur le disque, il n'y a que quelques très petits points très épars ; la ponctuation devient un peu plus dense le long des bords antérieur et postérieur ; scutellum à microsculpture moins nette que le disque du mésonotum, à ponctuation beaucoup plus dense, mais les espaces restent cependant nettement plus grands que les points ; mésopleures à ponctuation dense, mais peu visible sous la pilosité argentée ; épimères entièrement ponctués comme le reste de la surface. Aire dorsale du propodéum très nettement limitée par de fortes carènes, avec une carène longitudinale médiane à sa base et quelques autres carènes, ne formant pas un réseau (fig. 34) ; faces latérales du propodéum finement et irrégulièrement striolées. Abdomen brillant avec une très fine ponctuation, peu serrée, les espaces nettement plus grands que les points. Comme c'est généralement le cas chez les espèces de ce genre, le métatarse 3 s'élargit de la base jusqu'au milieu, puis se rétrécit jusqu'à l'extrémité, avec une rangée de poils courts à la face inférieure, dans la moitié basale. Cellule radiale 3 fois aussi longue que large (dimensions intérieures) ; la 2e cellule cubitale avec un pétiole plus court que ses côtés, la 3e cellule cubitale assez étroite ; la 1ère nervure récurrente aboutit dans la partie terminale de la 1ère cellule cubitale, la 2e un peu après le milieu de la 2e cellule cubitale.

Le caractère le plus frappant de cette espèce est la ponctuation tout à fait éparse du mésonotum, combinée avec une ponctuation dense des mésopleures.

Solierella antennalis n. sp.

Tr.S. : Jebel Soda, 3.iii.52, 1♂ type, 3♂ paratypes.

♂. 2,5 mm. Mandibules à pointe ferrugineuse, plus ou moins jaunâtres au milieu. Sont d'un jaune blanchâtre : 2 longues taches au collare, les tubercules huméraux, les tegulae, le postscutellum, une assez grande tache à l'extrémité des fémurs 1, de plus petites taches à l'extrémité des fémurs 2 et 3, les tibias et les tarses ; tous les tibias avec une tache noire allongée à la face antérieure ; nervures d'un ferrugineux clair.

Mandibules sans dent à leur bord inférieur ; partie médiane du clypéus parfois avec une légère carène longitudinale, brillante, mais ponctuée, terminée en avant par une pointe très aiguë ; antennes de 13 articles, minces à la base, s'épaississant notablement vers l'extrémité ; le 2e article du funicule est plus court que le 1er, à peine plus long que large ; les articles médians ne sont également pas beaucoup plus longs que larges, les avant-derniers plus courts que larges, le dernier très développé, à peu près aussi long que les 4 précédents réunis (fig. 30) ; tête brillante, sans

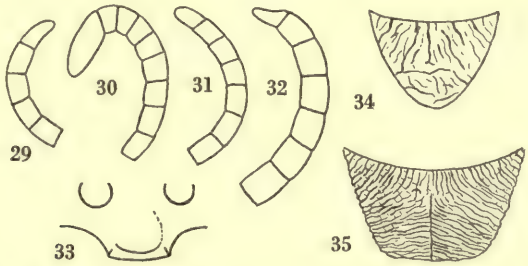
microsculpture ; face avec une ponctuation dense, plus ou moins entremélée de stries longitudinales irrégulières ; sur le vertex, la ponctuation devient très fine, également plus ou moins mélée de stries. POL : OOL = à peu près 2 : 1 ; OOL = le diamètre d'un ocelle. Dos du thorax brillant, sans microsculpture, avec une ponctuation, nette, de densité variable selon les individus ; sur le mésonotum, les espaces peuvent être aussi grands ou nettement plus grands que les points ; la ponctuation du scutellum est plus dense que celle du mésonotum ; mésopleures à ponctuation dense et un peu irrégulière en avant, devenant très espacée le long des métapleures ; épimères lisses et brillants, ne montrant que quelques très petits points. Aire dorsale du propodéum avec une très fine réticulation de base, bordée par de très fines carènes, avec une très fine carène médiane et parfois d'autres petites carènes irrégulières : faces latérales du propodéum finement et assez régulièrement striolées, la face postérieure striée transversalement sans fossette nette. Abdomen brillant, avec une ponctuation excessivement fine, assez dense. Métatarses 3 avec la dilatation habituelle. Cellule radiale 3 fois aussi longue que large ; la 2e cellule cubitale avec un pétiole plus court que ses côtés ; la 1ère nervure récurrente aboutit dans la partie terminale de la 1ère cellule cubitale, la 2e un peu après le milieu de la 2e cellule cubitale.

Ces ♂ sont bien caractérisés par la structure de leurs antennes.

Solierella babaulti n. sp.

Tr.N. : Gargaresc, 23.v.52, 1♂ type, 1♀ allotype, 3♀ paratypes.

♂. 2,5 mm. Mandibules jaunâtres à pointe ferrugineuse. Sont d'un jaune blanchâtre : 2 longues taches, se touchant presque au milieu, au collare, les tubercules huméraux, les tegulae, le postscutellum, une assez grande tache à l'extrémité des



FIGS. 29–35.—*Solierella*. (29) *S. guichardi* n. sp. ♂ antenne. (30) *S. antennalis* n. sp. ♂ *id.* (31) *S. babaulti* n. sp. ♂ *id.* (32) *S. obscura* n. sp. ♂ *id.* (33) *S. babaulti* ♀ clypéus. (34) *S. guichardi* aire dorsale du propodéum. (35) *S. obscura* n. sp. *id.*

fémurs 1, de plus petites taches à l'extrémité des fémurs 2 et 3, les tibias et les tarses ; les tibias avec une tache brune à la face antérieure. Extrémité des tergites assez largement décolorée. Nervures d'un brun foncé.

Mandibules sans dent à leur bord inférieur ; partie médiane du clypéus sans carène longitudinale, brillante, peu ponctuée, terminée en avant par une pointe aiguë. Antennes de 12 articles ; le 2e article du funicule pas plus long que le 1er,

à peine plus long que large ; les articles suivants plus longs, mais aucun n'est 2 fois plus long que large ; le dernier de la longueur du précédent, régulièrement arrondi à l'extrémité (fig. 31) ; tête brillante, à microsculpture à peine développée ; face à ponctuation dense, entremêlée de stries longitudinales irrégulières ; la ponctuation du vertex, plus fine et plus espacée, est également entremêlée de stries. POL : OOL = 7 : 5 ; OOL un peu plus grand que le diamètre d'un ocelle. Dos du thorax brillant, presque sans microsculpture ; la ponctuation du mésonotum est fine et peu dense, avec des espaces nettement plus grands que les points, entremêlée de stries transversales ; ces stries sont bien visibles sous certains éclairages, surtout dans la partie postérieure du mésonotum ; scutellum à ponctuation plus dense que le mésonotum ; mésopleures à ponctuation dense et irrégulière, un peu plus espacée sur les épimères. Aire dorsale du propodéum indistinctement limitée, mate, très finement réticulée et de plus un peu striolée, surtout transversalement ; faces latérales finement striolées ; face postérieure striée transversalement avec une étroite fossette longitudinale. Abdomen brillant, avec une ponctuation excessivement fine, assez dense. Métatarses 3 avec la dilatation habituelle. Cellule radiale 3 fois aussi longue que large ; la 2e cellule cubitale avec un pétiole plus court que ses côtés ; la 1ère nervure récurrente aboutit dans la partie terminale de la 1ère cellule cubitale, la 2e un peu après le milieu de la 2e cellule cubitale.

♀. 2,5–3 mm. Coloration comme chez le ♂.

La partie médiane du clypéus est brillante, imponctuée ; elle forme une saillie, tronquée ou à peine arquée en avant, limitée de chaque côté par un angle très net (fig. 33) ; antennes de 12 articles, plus allongés que chez le ♂ ; le 2e article du funicule est 1,5 fois aussi long que large, les articles médians 2 fois aussi longs que larges ; tête avec une microsculpture beaucoup plus nette que chez le ♂, avea une ponctuation plus espacée, également entremêlée de stries ; sur le dos du thorax aussi, la microsculpture est plus nette ; la striation transversale du mésonotum est assez variable, parfois peu évidente. L'aire pygidiale n'est pas nettement limitée, brillante, mais microsculptée.

Cette espèce est voisine d'*antennalis* ; le ♂ s'en distingue facilement par la structure des antennes ; chez les 2 sexes, la fine striation transversale de l'aire dorsale du propodéum et celle, généralement présente, du mésonotum, sont caractéristiques.

L'espèce est dédiée à M. R. M. Babault, qui fut le collaborateur de M. Guichard en Libye.

Solierella obscura n. sp.

Tr.S. : Jebel Soda, 3.iii.52, 1♂ type.

♂. 3 mm. Corps sans dessins jaunes ; mandibules à pointe ferrugineuse ; tarses bruns ; tegulae d'un ferrugineux très sombre ; nervures d'un brun foncé.

Mandibules sans dent à leur bord inférieur ; partie médiane du clypéus brillante, mais ponctuée, assez gibbeuse, avec une légère carène longitudinale, terminée en avant par une pointe très aiguë ; antennes de 13 articles ; le 2e article du funicule est très court, pas plus long que large à l'extrémité ; les articles suivants sont plus longs, mais aucun n'est 2 fois aussi long que large ; le dernier article est petit, pointu,

plus court et plus brillant que les précédents (fig. 32) ; tête brillante, sans microsculpture ; face réticulée ; vertex avec des points espacés, un peu irréguliers, sa partie postérieure un peu striolée transversalement. POL : OOL = à peu près 2 : 1 ; OOL = le diamètre d'un ocelle. Mésonotum et scutellum brillants, sans microsculpture, avec une ponctuation nette et régulière, les espaces un peu plus grands que les points ; les mésopleures avec une ponctuation plus forte, les épimères par contre avec une ponctuation beaucoup plus fine et espacée, leur partie postérieure imponctuée et brillante. Le propodéum est beaucoup plus brusquement tronqué en arrière que chez les autres espèces ; sa face dorsale est courte et large, les faces latérales convergeant peu en arrière ; l'aire dorsale médiane, est limitée par des carènes nettes, situées à peu de distance des bords latéraux de la face dorsale et un peu plus convergentes en arrière que ceux-ci ; elle ne se poursuit pas sur la face postérieure ; elle est parcourue par une carène longitudinale médiane et par un grand nombre de carènes sinueuses, obliques ou plus ou moins transversales (fig. 35) ; ces carènes se poursuivent en dehors de l'aire médiane, jusqu'au bord de la face dorsale ; faces latérales du propodéum à striation régulière ; face postérieure à striation transversale moins régulière, sans fossette. Abdomen brillant, à ponctuation très fine et assez dense. Les métatarses 3 ne montrent pas trace de la dilation que l'on voit généralement chez les ♂ de ce genre ; ils sont ciliés sur toute la longueur de leur arête inférieure. Cellule radiale presque aussi longue que la 1ère cellule cubitale, un peu plus de 3 fois aussi longue que large ; la 1ère nervure récurrente aboutit assez loin avant la 2e cellule cubitale, la 2e au milieu de celle-ci.

Ce ♂ est bien caractérisé par son propodéum et ses métatarses 3.

Genre ***PSEN*** Latreille

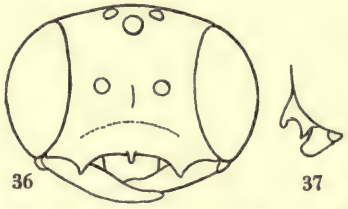
Psen (Mimesa) sublaevis de Beaumont

Fe. : In Aramas, 1♂ ; El Manakh, 3♂ ; Brak, 1♀ ; Gatroun, 1♂. Ti. : Enneri Meché, 1♂ ; Enneri Kudi, 3♀ ; Bardai, 1♀.

J'ai décrit récemment (1954*a*) cette espèce d'aprés un seul ♂ des Canaries ; ne trouvant entre ce ♂ et ceux du Sahara que de très minimes différences de sculpture, j'admets qu'ils appartiennent à la même espèce ; pour vérifier le fait, il serait utile de pouvoir examiner une ♀ des Canaries. Je redonne ci-dessous une description complète de l'espèce, basée principalement sur la ♀.

♀. 9–10 mm. Mandibules jaunes, noirâtres à la base, ferrugineuses et noires à la pointe ; palpes jaunes ; funicule d'un ferrugineux jaunâtre à la face inférieure, ferrugineux et noirâtre à la face supérieure ; tubercules huméraux, tegulae (en partie transparentes), plaques précostales et base des nervures d'un blanc jaunâtre ; le reste des nervures d'un ferrugineux plus ou moins brunâtre ; ailes hyalines ; extrémité du 1er tergite, la plus grande partie du 2e segment, la moitié postérieure du 6e tergite, ferrugineuses ; une petite tache à l'extrémité des fémurs, les tibias et les tarses d'un blanc jaunâtre ; tous les tibias avec une large ceinture foncée, étroitement interrompue, ferrugineuse aux pattes antérieures, noirâtre sur les autres.

Face et clypéus couverts d'une pilosité argentée plus ou moins dressée, cachant la sculpture ; le clypéus est de forme très particulière (fig. 36), bien visible surtout chez les individus dont la pilosité est en partie arrachée ; son bord antérieur est largement échancré en arc ; les angles latéraux sont saillants en pointe aiguë ; au fond de l'échancrure se trouve une 3e pointe, saillante, à extrémité arrondie (fig. 37) ; le labre, en forme de grande plaque mince, apparaît dans l'échancrure du clypéus ; son extrémité, visible lorsqu'elle repose sur les mandibules, est densément ponctuée et velue ; le tubercule interantennaire apparaît plus ou moins dans la pilosité, sous forme d'une petite lame longitudinale. Funicule nettement claviforme ; le 2e article est grêle, 4 fois aussi long que large ; le 3e article est 2,5 fois aussi long que large ; les avant-derniers articles ne sont pas plus longs que larges ; vertex demi-brillant, avec une très fine réticulation de base et de petits points espacés d'où sortent de longs poils dressés ; POL : OOL = 6 : 5. Collare bordé de



FIGS. 36–37.—*Psen* (*Mimesa*) *sublaevis* de Beaumont ♀. (36) Tête vue de face. (37) Clypéus vu de profil.

poils argentés, à angles latéraux saillants, droits lorsqu'on les examine par dessus ; mésonotum sculpté comme le vertex, mais un peu plus brillant, les points piligères très petits et très espacés sur le disque, un peu plus denses en avant, en arrière, et le long des sillons parapsidaux, qui sont nets ; quelques stries obliques aux angles antérieurs ; scutellum plus brillant que le mésonotum, avec de très petits points épars ; partie antérieure des mésopleures, entre l'aire épicnémiale et la suture épisternale, rugueuse, avec une pilosité dense ; tout le reste des mésopleures montrant la même sculpture que le mésonotum, mais avec une ponctuation extrêmement fine et très dispersée ; la suture épimérale est indiquée par un très fin sillon et par une petite fossette. Le propodéum ne montre pas la forte réticulation que l'on voit généralement chez les espèces de ce genre ; sa sculpture est partout très fine ; l'aire dorsale n'est pas limitée par des carènes ou ne l'est que très partiellement ; une partie de sa surface montre de fines stries divergeant depuis la base ; la partie postérieure des faces latérales est rugueuse, avec une pilosité dressée. Le pétiole est très long ; vu de profil, sa longueur, par rapport au 1er tergite, est de 4 : 3 ; ses faces latérales ne sont pas rebordées à la limite de la face dorsale ; cette dernière est parcourue par une carène, aplatie dans sa moitié basale ; le 1er tergite, vu par sa face dorsale, est nettement plus long que large à l'extrémité ; les tergites 1–5 sont mats, avec une pruinosité argentée bien visible sous certains angles ; 6e tergite avec une grande aire pygidiale, nettement bordée, à ponctuation dense et avec des soies couchées. Tibias et tarses avec des épines beaucoup plus nombreuses et beau-

coup plus longues que chez les espèces européennes du genre ; le métatarse antérieur montre un peigne formé généralement de 9 épines ; les plus développées ont une longueur dépassant la largeur de l'article. Les 2 nervures récurrentes aboutissent dans la 2e cellule cubitale ; la 3e cellule cubitale est relativement peu étirée à son angle apical inférieur.

♂. 6,5–8 mm. Coloration comme la ♀, mais la couleur ferrugineuse de l'abdomen est très réduite chez certains individus.

Sculpture et pilosité des diverses parties du corps comme chez la ♀ ; la forme du bord antérieur du clypéus varie un peu d'un individu à l'autre ; il y a une petite échancrure médiane, plus ou moins profonde, limitée de chaque côté par un petit lobe saillant ; plus latéralement on voit de chaque côté un 2e petit lobe, plus ou moins développé ; 2e article du funicule plus de 2 fois, le 3e un peu moins de 2 fois aussi longs que larges. Le 6e tergite est beaucoup plus fortement sculpté que les précédents, largement arrondi à l'extrémité, relativement peu bombé, mais sans véritable aplatissement sur sa face dorsale. Les épines des pattes sont naturellement moins développées que chez la ♀, mais cependant plus longues que chez les espèces européennes.

Genre ***DIODONTUS*** Curtis

Diodontus oraniensis Lepeletier

Cy. : Derna, 2♂. Tr.N. : Sabratha, 4♂ ; Tripoli, 1♂, 6♀ ; Sidi Bennur, 2♂, 3♀ ; Zliten, 1♀ ; Iefren, 1♂ ; Garian Hills, 1♂. Tr.S. : Hon oasis, 10♀ ; Zella oasis, 15♂ ; Hon, 14♂, 1♀. Fe. : Mourzouk, 1♀.

L'examen des types (Mus. Vienne) m'a démontré que *D. moricei* Kohl, d'Egypte, est synonyme de *D. oraniensis*.

Diodontus friesei Kohl

Tr.S. : Hon, 8♂.

Détermination à vérifier.

Genre ***CROSSOCERUS*** Lepeletier et Brullé

Crossocerus elongatulus van der Linden

Tr.N. : Sabratha, 3♂, 1♀ ; Corradini, 1♂ ; Gargaresc, 1♀ ; Zliten, 1♂.

Genre ***LINDENIUS*** Lepeletier et Brullé

Lindenius hamilcar Kohl

Tr.N. : Sabratha, 1♂, 2♀ ; Homs, 1♀ ; Zliten, 1♀ ; Azizia-Garian Rd., 1♀.

Genre ***OXYBELUS*** Latreille

(Voir : Verhoeff 1948 : Guiglia 1953.)

Oxybelus lamellatus Olivier

Tr.N. : Sabratha, 1♂, 1♀. Fe. : Mourzouk, 5♂, 5♀ ; Oum el Araneb, 17♂ ; Brak, 1♂.

Oxybelus phyllophorus Kohl

Ti. : Bardai, 1♀.

Oxybelus diphyllus Costa

Ti. : Bardai, 1♀.

Oxybelus verhoeffi de Beaumont (1950*a*)

Fe. : Brak, 1♂.

Malgré une coloration beaucoup plus foncée et certaines différences de sculpture, je suppose que cet individu est bien le ♂, encore inconnu, de *verhoeffi* ; il présente en effet en commun avec la ♀ quelques caractères fondamentaux. Voici sa description.

Taille 5 mm. Mandibules jaunes à pointe ferrugineuse et noire ; funicules ferrugineux, un peu obscurcis en dessus. Sont jaunes sur le thorax : les tubercules huméraux, les bords latéro-postérieurs de scutellum et du postscutellum, la moitié interne des lamelles, une tache au fond du mucron ; sont translucides : la lame du collare, les bords latéraux du scutellum, la partie externe des lamelles, l'extrémité du mucron. Abdomen noir ; le 1er tergite avec 2 taches jaunes, assez étroites, très pointues à l'intérieur où elles se touchent presque ; 2e tergite avec des taches semblables, plus étroites ; 3e tergite à taches très étroites au bord postérieur ; tergites 4–6 noirs, le 7e ferrugineux. Fémurs noirs, ceux des 2 premières paires avec de petites taches apicales jaunes ; tous les tibias avec une tache basale jaune, ceux de la 1ère paire ferrugineux, ceux des autres paires en grande partie noirâtres ou noirs ; tarses ferrugineux. Tegulae, plaque précostale et nervures d'un ferrugineux jaunâtre.

Morphologiquement, ce ♂ rappelle la ♀ par la ponctuation de la tête, la lamelle surélevée et échancrée du collare, la forte réticulation des mésopleures, le mésosternum avec une fine microsculpture le rendant demi-mat et avec quelques points isolés, la forte carène longitudinale de la partie postérieure du mésonotum et du scutellum, la forme des lamelles et du mucron, la ponctuation forte et espacée du 2e sternite, les épines des métatarses bien développées ; le métatarse 1 montre un peigne de 5 épines, l'apicale dépassant l'apex du 2e article ; le métatarse 2, outre l'épine apicale, montre 2 épines sur sa face dorsale d'un côté de l'insecte, une de l'autre. La ponctuation du dos du thorax et de l'abdomen est plus espacée que chez la ♀ ; sur le 2e tergite, par exemple, les espaces sont en moyenne aussi grands que les points ; les stries latérales du postscutellum sont un peu moins nettes que chez la ♀. Le clypéus rappelle celui de *victor* Lepeletier ; le lobe médian n'est en effet pas caréné ("stumpfe Nase"). Chez *collaris* Kohl, qui possède aussi une forte lamelle au collare, le clypéus du ♂ ressemble à celui de la ♀ et ne présente pas les 3 pointes habituelles.

Oxybelus fischeri Spinola

Tr.S. : Zella oasis, 1♂, 1♀ ; Hon, 1♀. Fe. : Mourzouk, 3♂, 7♀ ; Oum el Araneb, 3♂, 2♀ ; Brak, 2♂.

Oxybelus pugnax moricei de Beaumont

Tr.N. : Giado, 2♂ ; Jefren 1♂, 1♀.

Oxybelus victor Lepeletier

Tr.N. : Giado, 1♀.

Individu foncé ; le thorax ne montre qu'une petite tache claire sur les tubercules huméraux ; d'étroites taches sur les tergites 1–4. Les fémurs 3 avec une tache ferrugineuse à l'extrémité.

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N.B.—Les travaux de Zavattari (1934) et Guiglia (1942) comprenennt une bibliographie complète sur les Hyménoptères de la Libye.

Addendum

J'ai reçu encore de M. Guichard quelques Sphecidae de Tripolitaine, parmi lesquels trois espèces ne figuraient pas dans les envois précédents.

Ammophila (*Coloptera*) *barbara* Lepeletier
Tr. N.: Bugheilan, 18.iii.55, 4 ♂, 1 ♀.

Cerceris berlandi Giner Mari
Tr. N.: Bugheilan, 18.iii.55, 3 ♂.

Trypoxylon aegyptiacum Kohl
Tr. N.: Tarhuna, 22.vii.55, 1 ♀.

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CENTROCNEMINAE, A NEW SUB-FAMILY OF THE REDUVIIDAE (HEMIPTERA-HETEROPTERA)

By N. C. E. MILLER

THE genus *Centrocnemis* was erected by Signoret in 1852 (*Ann. Soc. ent. France :* 545) for the species *deyrollii*. Subsequently the following species were added to the genus : *signoreti* Stål (1863, *Ann. Soc. ent. France :* 48), *granulosa* Stål (1866, *Öfv. Vet. Ak. Förh. :* 244), *ståli* Reuter, (1881, ad *Cognit. Reduv. Mundi Antiqui* : 65, *Acta. Soc. Sci. fenn.* : 12), *philippinensis* Distant, (1902, *Ann. Mag. nat. Hist.* (7) **10** : 181), *formosana*, Matsumura (1913, *Thous. Ins. Japan, Addit.* **1** : 161) and *roepkei* Miller, (1955, *Tijdschr. Ent.* **98** : 61).

Recently, however, in the collection of the British Museum (Nat. Hist.) London and in collections received from the Naturhistoriska Riksmuseum Stockholm, Sweden, the Zoologisch Museum Amsterdam, the Rijksmuseum van Natuurlijke Historie Leiden, The Netherlands and the Zoologisches Institut Berlin, Germany, several new species have been discovered. I have described and figured these as well as all the other species referred to above.

A close study of the species at present assigned to the genus *Centrocnemis* has revealed, however, that not all of them actually should be placed in it. For these I have erected the following new genera : *Neocentrocnemis, Paracentrocnemis* and *Centrocnemoides*.

It is also evident that none of the genera should be placed in the sub-family Reduviinae, in which they are at present, mainly on account of the structure of the rostrum which is composed of four visible segments (Fig. 1, A). The type of glandular system also is different from that of the Reduviinae, and indeed from that of most other sub-families, in that the glands are paired in the adult with the ostioles of one pair situated in the metasternal depressions and close to the inner margin of the acetabula and the other pair with the ostiole located on the metapleural epimeron and near its basal margin. The location of a single pair of ostioles in the metasternal depressions is characteristic for most adult Reduviidae.

I have examined the genitalia of most of the species dealt with in this paper and have found that they are very similar structurally. In view of this I have figured the aedeagus of one species only—*Centrocnemis truculenta* sp. n. (Fig. 1, B).

Its principal features are the short basal plates and the two filamentous processes arising from them. These are thickened at the point of attachment with the basal plates and serve to join them to the wall of the pygophore.

The vesica is strongly sclerotized throughout, is bilobed apically and on each side of it a moderately wide area of the conjunctiva is more highly sclerotized than the

remainder. In many Reduviidae the lateral arms of the basal plates are relatively very long and somewhat slender.

Members of the sub-family Centrocneminae sub-fam. nov. are somewhat poorly represented in collections and, on the whole, would appear to be rare.

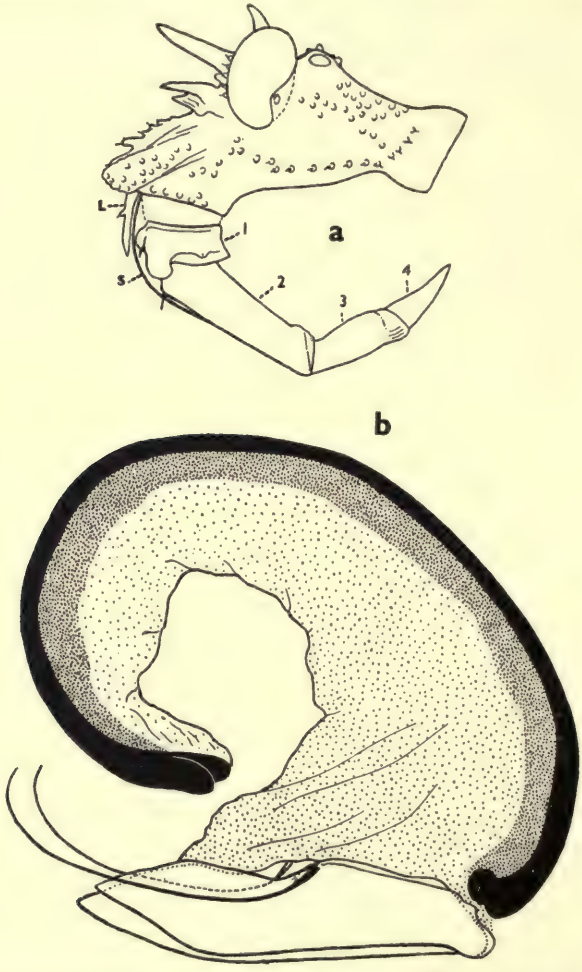

FIG. 1. A. *Neocentrocnemis signoreti* (Stål), gen. n., head and rostrum (lateral view).
B. *Centrocnemis truculenta* sp. n., aedeagus.

The present known distribution of the genus *Centrocnemis* is Northern India and Malaysia; of the genus *Neocentrocnemis*, Malaysia, Celebes, the Philippine Islands, Indo-China and Formosa; of *Paracentrocnemis*, S. India and Ceylon; and of *Centrocnemoides*, Malaysia (Malay Peninsula, Sumatra and Java).

So far as I am aware there is no information regarding the biology of members of this sub-family existing, apart from the fact that they have all been found on

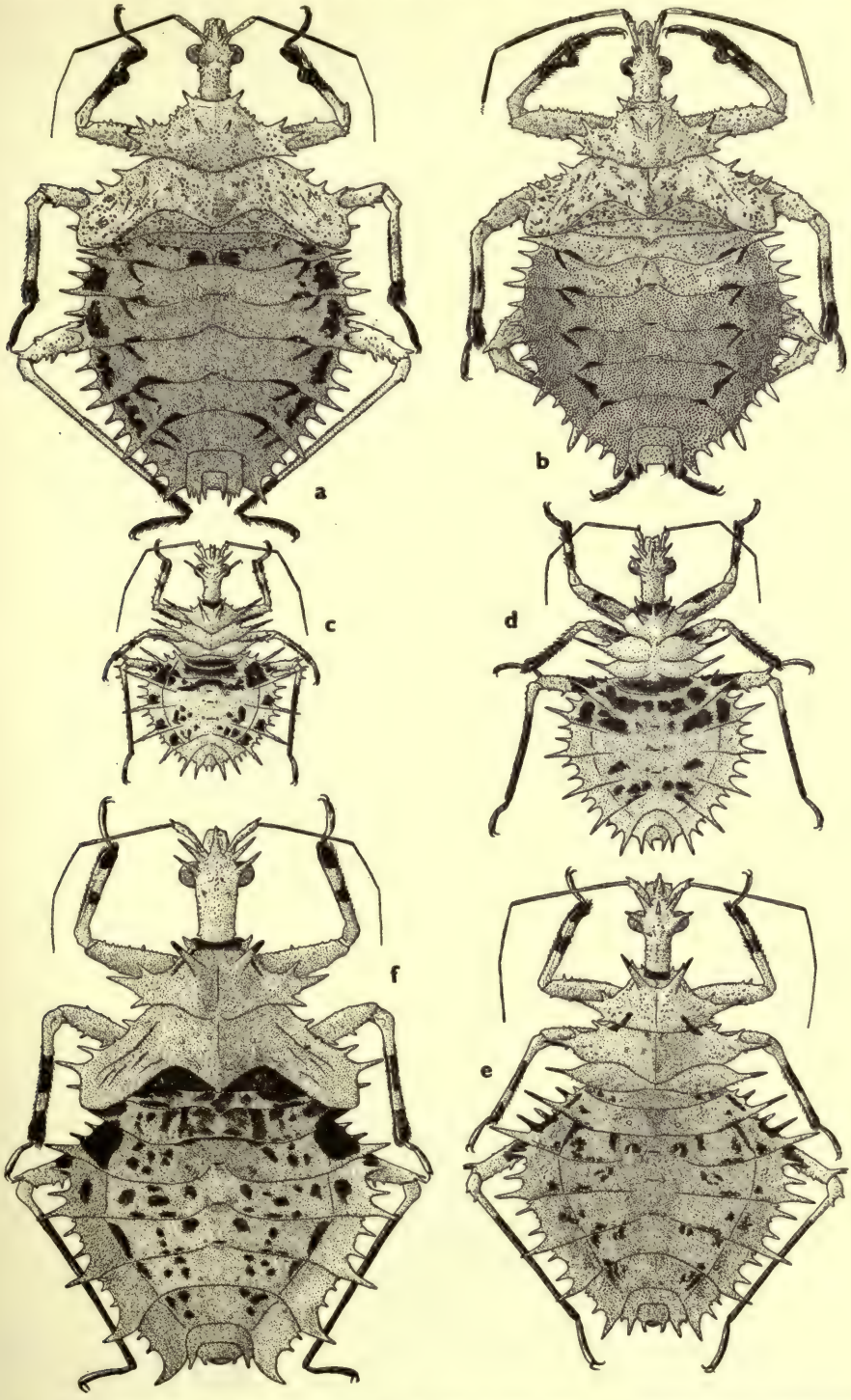

FIG. 2. A. *Centrocnemis leprosa* sp. n., 5th instar neanide. B. *Centrocnemis truculenta* sp. n., 5th instar neanide. C. *Neocentrocnemis signoreti* (Stål), gen. n., 2nd instar neanide; D. *idem* 3rd instar; E. *idem* 4th instar; F. *idem* 5th instar.

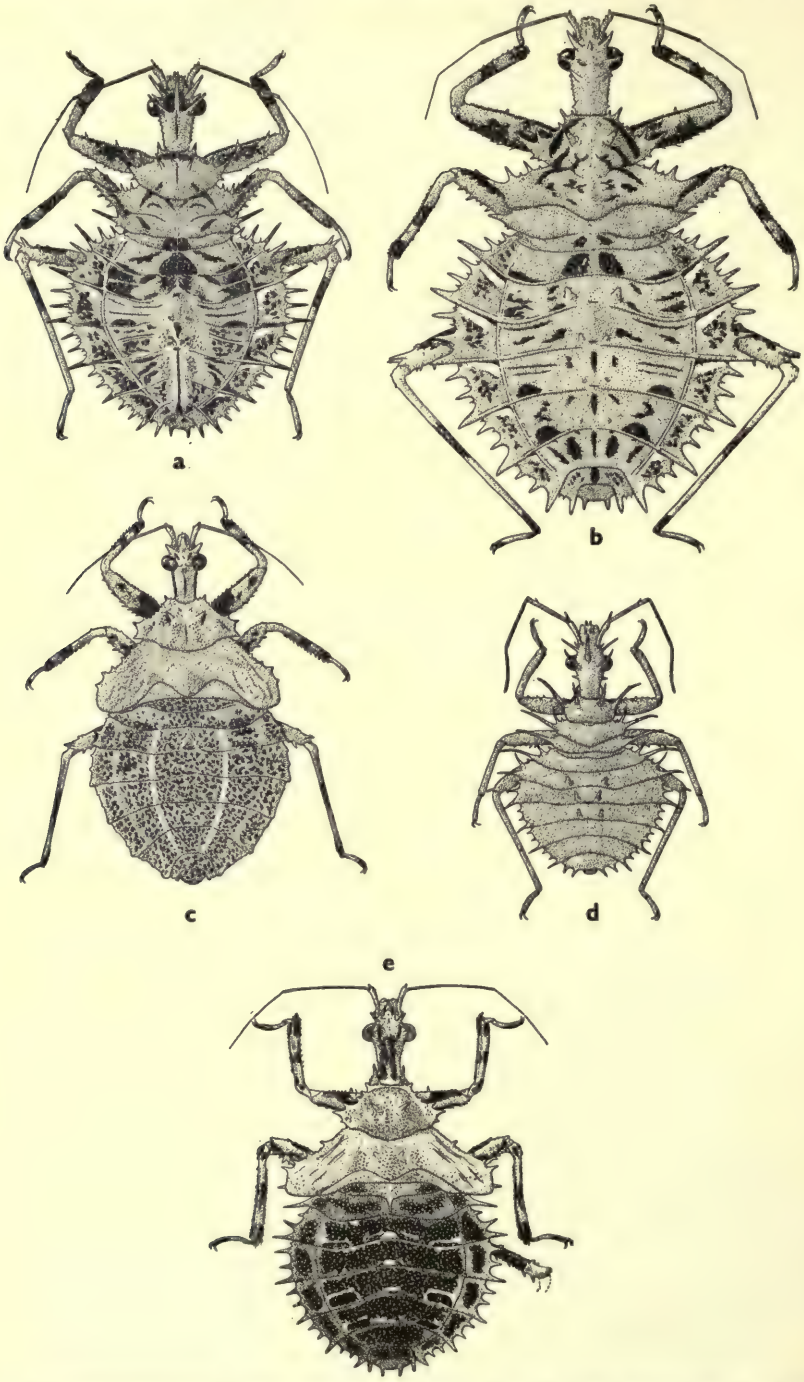

FIG. 3. A. *Neocentrocnemis palawanica* gen. n., sp. n., 3rd instar neanide; B. *idem* 4th instar; C. *Paracentrocnemis campbelli* gen. n., sp. n. 5th instar neanide; D. *Paracentrocnemis rugipennis* gen. n., sp. n., 3rd instar neanide; E. *Centrocnemoides drescheri* gen. n., sp. n., 5th instar neanide.

trees in primary forests and in one case, at least, attraction to artificial light has been reported.

The somewhat flattened habitus of both neanides and adults suggests that for at least some part of their existence they are sub-corticolous. They have the mid-ventral area of the abdomen distinctly flattened—a characteristic of certain genera belonging to the Reduviinae, namely, *Velitra* Stål, *Staliastes* Kirkaldy and *Sminthus* Stål, which are known to favour that type of habitat.

I express my thanks to Professor Teiso Esaki, Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan, for the type of *Neocentrocnemis formosana* (Matsumura); to the Director of the Zoologisch Museum Amsterdam, The Netherlands, for the type of *Neocentrocnemis roepkei* (Miller); to Dr. René Malaise, Naturhistoriska Riksmuseum Stockholm, Sweden, for the types of *Neocentrocnemis ståli* (Reuter) and of *Centrocnemoides granulosa* (Stål), and a paratype of *Neocentrocnemis signoreti* (Stål); to Dr. Max Beier, Naturhistorisches Hofmuseum Vienna, Austria, for the type of *Centrocnemis deyrollii* Signoret; to Dr. H. C. Blöte, Leiden Museum, The Netherlands; Professor G. C. Varley, Hope Department, University Museum Oxford, England; and to Professor Hans Sachtleben, Deutsches Entomologisches Institut Berlin, Germany, for species belonging to the sub-family Centrocneminae.

Centrocneminae sub-fam. nov.

Antennae inserted nearer to eyes than to apex of head; basal segment moderately thick with setigerous tubercles and an apical spine; segment 2 somewhat compressed and with tubercles; segments 3 and 4 slender, setose. Head moderately elongate with a spine on antennal tubercles, at upper margin of eyes, at lateral emargination of eyes and a pair of spines on vertex. Eyes sub-pedunculate; from the side reniform. Ocelli small, narrowly separated and somewhat elevated. Rostrum composed of four visible segments with tubercles on basal segment.

Body somewhat compressed dorso-ventrally. Pronotum tuberculate and with discal tubercles or spines; laterally expanded; posterior margin with a projection sub-laterally, which rests against the basal lateral scutellar spine. Prosternum with spines or tubercles at external apical angle; stridulatory furrow wide and shallow, with the striate area elliptical in outline; meso- and metasternum fused, the former carinate throughout, the latter carinate posteriorly. Pleura tuberculate; mesopleura with prominent tubercles on anterior margin which overlap part of the posterior margin of the propleural epimeron. Scutellum with apex produced, the disc somewhat depressed, tuberculate and with an erect spine basally laterally. Metathoracic glands paired with one ostiole in each metasternal depression and another ostiole at the external angle of the mesopleural epimeron.

Abdomen with external margin of connexival segments spinose or tuberculate; mid-ventrally with a flattened area with marginal carinae; spiracles small and located more or less in middle of segment. Pygophore with a triangular projection on apical margin adjacent to site of insertion of harpagones and with a triangular sub-apical elevation; 8th segment ventrally in male not normally visible; 9th

dorsal segment in female longitudinally depressed, the depression sometimes with transverse sulci with setigerous tubercles.

Hemelytra complete; vein R with cross-veins to Sc; M connected to Cu by a cross-vein, thus forming a quadrate cell; portion of R in membrane connected usually to M by a cross-vein; IA with a branch vein; metathoracic wings with Sc and R fused basally; Iv sometimes present; IA and 2A and jugal veins distinct.

Legs: Tarsi composed of three segments; anterior tibiae with or without a preapical spur on lower surface; anterior and median tibiae and trochanters with denticles on lower surface; *fossula spongiosa* on anterior and median tibiae; anterior and median femora incrassate with spines and tubercles; posterior femora with spines and tubercles; coxae tuberculate; posterior coxae widely separated.

Key to genera of *Centrocneminae*.

1. Connexivum spined . . . . . 2.
–. Connexivum tuberculate . . . . . 4.
2. Anterior tibiae with a rounded, dentate spur on lower surface sub-apically; segment 2 of rostrum somewhat slender, longer than segments 3 and 4 together; basal antennal segment longer than anteocular; basal half of lower surface of anterior femora concave; metathoracic wings violaceous . . . . *Centrocnemis* Sign.
–. Anterior tibiae without a spur; segment 2 of rostrum as long as segments 3 and 4 together; basal antennal segment shorter than anteocular; basal half of lower surface of anterior femora not concave . . . . . 3.
3. Connexivum with long acute or triangular spines; metathoracic wings infumate *Neocentrocnemis* gen. nov.
–. Connexivum with short, narrow spines; metathoracic wings yellow *Centrocnemoides* gen. nov.
4. Metathoracic wings hyaline . . . . . *Paracentrocnemis* gen. nov.

Centrocnemis Signoret

Basal segment of antennae moderately thick, longer than anteocular, tuberculate; segment 2 moderately thick and somewhat compressed; segments 3 and 4 slender. Basal segment of rostrum tuberculate; segment 2 longer than segments 3 and 4 together. Head with spines dorsally and in emargination of eyes laterally; ocelli small, elevated; eyes sub-pedunculate. Pronotum tuberculate and spinose; posterior lobe laterally expanded. Scutellum apically produced and with a basal lateral spine. Hemelytra complete. Abdomen spinose laterally. Anterior tibiae with a preapical spur on lower surface. Femora spinose and tuberculate.

Key to *Centrocnemis* species (males)

1. Anterior lobe of pronotum greenish testaceous; tubercles on disc small, distinct, white . . . . . *leprosa* sp. n.
–. Anterior lobe of pronotum and tubercles dull testaceous . . . . . 2.
2. Segment 2 of rostrum suffused with brown on basal two-thirds. . . . *polita* sp. n.
–. Segment 2 of rostrum black, except apex narrowly white . . . *truculenta* sp. n.

Key to *Centrocnemis* species (females)

1. Dorsal surface of abdomen bright red . . . . . *cretacea* sp. n.
–. Dorsal surface of abdomen ferruginous . . . . . 2.
2. Lateral spines on collar very short, straight ; tubercles on head and pronotum mostly white . . . . . 3.
–. Lateral spines on collar moderately long, curved ; tubercles on head and pronotum testaceous . . . . . 4.
3. Discal tubercles on posterior pronotal lobe sub-cylindrical, rounded apically ; moderately long . . . . . *leprosa* sp. n.
–. Discal tubercles on posterior pronotal lobe narrowly conical, rounded apically, short *compta* sp. n.
4. Abdomen mid-ventrally very feebly flattened ; carinae obsolescent . . . . 5.
–. Abdomen mid-ventrally distinctly flattened and with granulose carinae . . . 6.
5. Sub-dorsal carinae on posterior pronotal lobe with prominent, broadly conical tubercle medially . . . . . *neglecta* sp. n.
–. Sub-dorsal carinae on posterior pronotal lobe with very short, conical tubercle medially . . . . . *sarawakensis* sp. n.
6. Tubercles on head, anterior lobe of pronotum and some tubercles on posterior lobe white apically . . . . . *suprema* sp. n.
–. Tubercles testaceous . . . . . 7.
7. Postero-lateral margin of posterior pronotal lobe strongly concave and with a few low, rounded tubercles . . . . . *malaccensis* sp. n.
–. Postero-lateral margin of posterior pronotal lobe feebly concave with a few long, cylindrical tubercles . . . . . *deyrollii* Signoret.

Type Species ***Centrocnemis deyrollii*** Signoret

(Text-fig. 4.)

1852, *Ann. Soc. ent. Fr.*, 545.

Colour. Dark testaceous. Lateral spines on collar and discal spines on anterior lobe of pronotum narrowly black apically. Scutellum, except tubercles, piceous. Segment 2 of rostrum black with whitish apex and tubercles ; segments 3 and 4 piceous. Meso- and metasternum piceous with median carina testaceous. Pleura, ventral surface of head strongly suffused with black. Lower surface of corium reddish ; membrane dark infumate with suffused black confluent spots ; metathoracic wings violaceous. Abdomen ventrally with strong piceous suffusion. Tarsi black ; apical two-thirds of anterior tibiae black with pale testaceous spot sub-apically on outer surface ; median tibiae narrowly black apically and with a wide suffused blackish median annulation ; posterior tibiae suffused with piceous except basally and a sub-apical moderately wide annulation testaceous ; anterior femora with concave lower surface and sides basally piceous ; median and posterior femora strongly suffused with piceous in basal half ; coxae and trochanters piceous.

Structure. Principal tubercles on basal rostral segment small, conical. Costal margin of corium strongly sinuate ; sparsely tuberculate. Carinae enclosing flattened area of abdomen ventrally moderately well-defined on segments 3 and 4, feeble on 5 and 6. Projections on posterior margin of posterior pronotal lobe rounded, tuber-

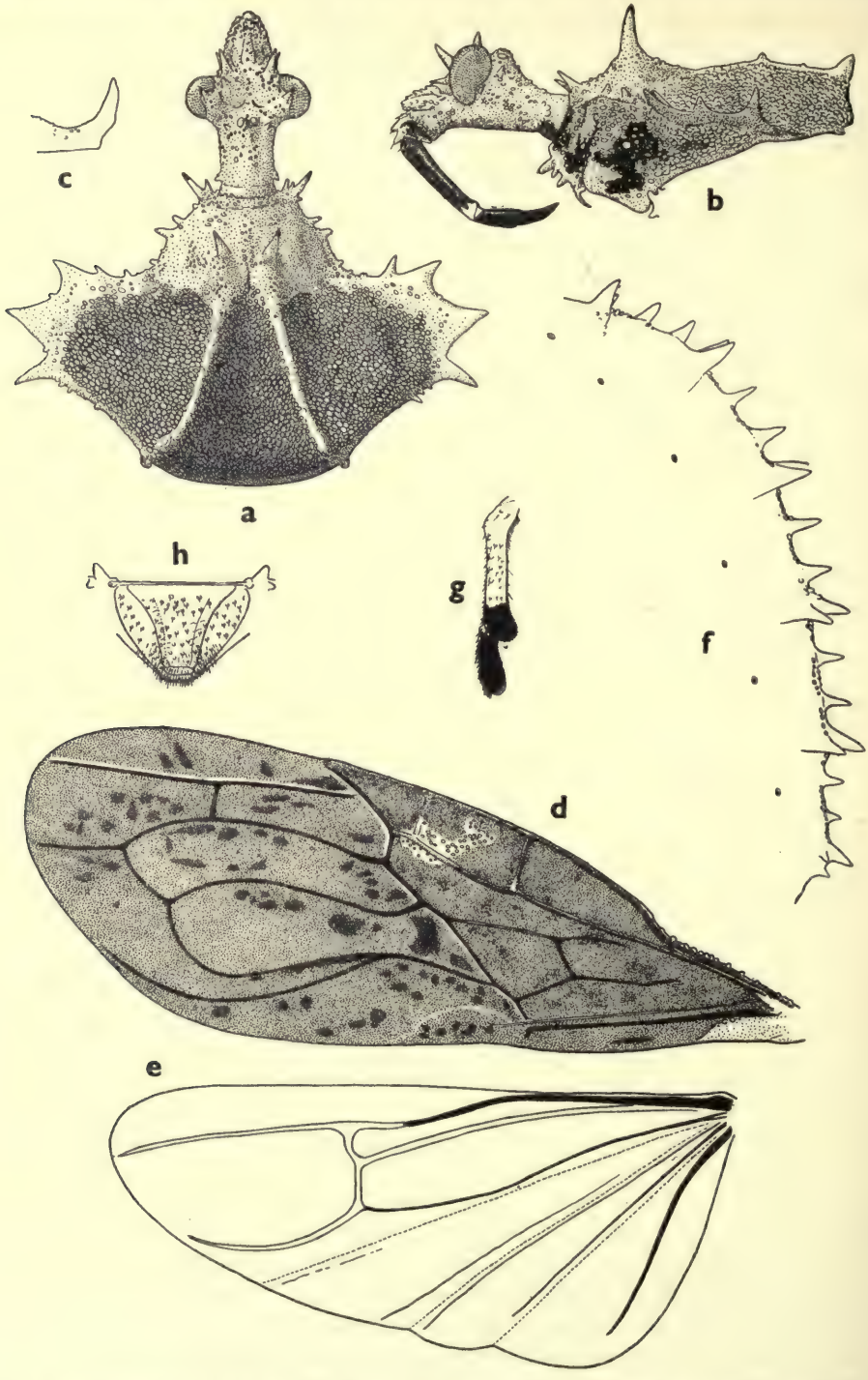

FIG. 4. *Centrocnemis deyrollii* Signoret. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia; H. apex of abdomen, ♀.

culate. Concave part of lower surface of anterior femora with somewhat sparse denticles and an ill-defined smooth median area.

	♀
Total length	30·00 mm.
Hemelytra	21·00 mm.
Greatest pronotal width	12·00 mm.

SPECIMEN EXAMINED. One ♀ (holotype), Silhet. coll. Signoret.
Holotype in Naturhistorisches Hofmuseum Vienna.

Centrocnemis truculenta sp.n.

(Text-fig. 5)

COLOUR. Testaceous. Tubercles on head and pronotum very pale. Posterior lobe of pronotum with somewhat obscure black suffusion. Scutellum black with a testaceous annulation at base of apical spine. Corium greenish testaceous; clavus suffused with black apically; tubercles very pale testaceous; membrane dark greyish with suffused fuscous spots; metathoracic wings infumate with violaceous suffusion. Head ventrally piceous. Segment 1 of rostrum piceous with testaceous tubercles; segment 2 black, narrowly whitish apically and with whitish tubercles; segments 3 and 4 piceous. Pleura suffused with piceous. Legs greenish testaceous; anterior tibiae black in apical two-thirds with pale testaceous tubercles and spines; concave lower surface of anterior femora piceous; tubercles and spines testaceous; median and posterior femora strongly suffused with piceous; median and posterior tibiae black apically and with a wide median blackish annulation; coxae and trochanters piceous; tubercles testaceous.

STRUCTURE. Principal tubercles on basal rostral segment conical, rounded apically. Posterior lobe of pronotum with an irregular, transverse, tuberculate elevation between median tubercles on sub-dorsal carinae. Projections on posterior margin of posterior pronotal lobe very short, rounded, tuberculate. Dorsal surface of connexival segments with abundant, very small granules; apical margin of segments with a varying number of short, erect tubercles. Carinae enclosing flattened area of abdomen ventrally minutely granulose. Concave part of lower surface of anterior femora with scattered denticles and an ill-defined smooth median area.

	♂
Total length	23·50 mm.
Hemelytra	15·00 mm.
Greatest pronotal width	9·50 mm.

SPECIMEN EXAMINED. One ♂ (holotype), Java (no precise locality). Holotype in British Museum (Nat. Hist.), London.

5th instar neanide (Text-fig. 2, B)

COLOUR. Testaceous. Basal segment of antennae black apically and with white tubercles; segment 2 of antennae broadly blackish testaceous basally, apically pale

testaceous ; remainder black with white tubercles ; segment 3 blackish with testaceous suffusion basally. Tubercles and spines, particularly the former on head and pronotum, pale testaceous. Apex of lateral spines on collar, of discal and lateral tubercles on pronotum narrowly brown apically. Granules on abdomen dorsally pale testaceous. Segment 2 of abdomen dorsally with a large elongate fuscous spot

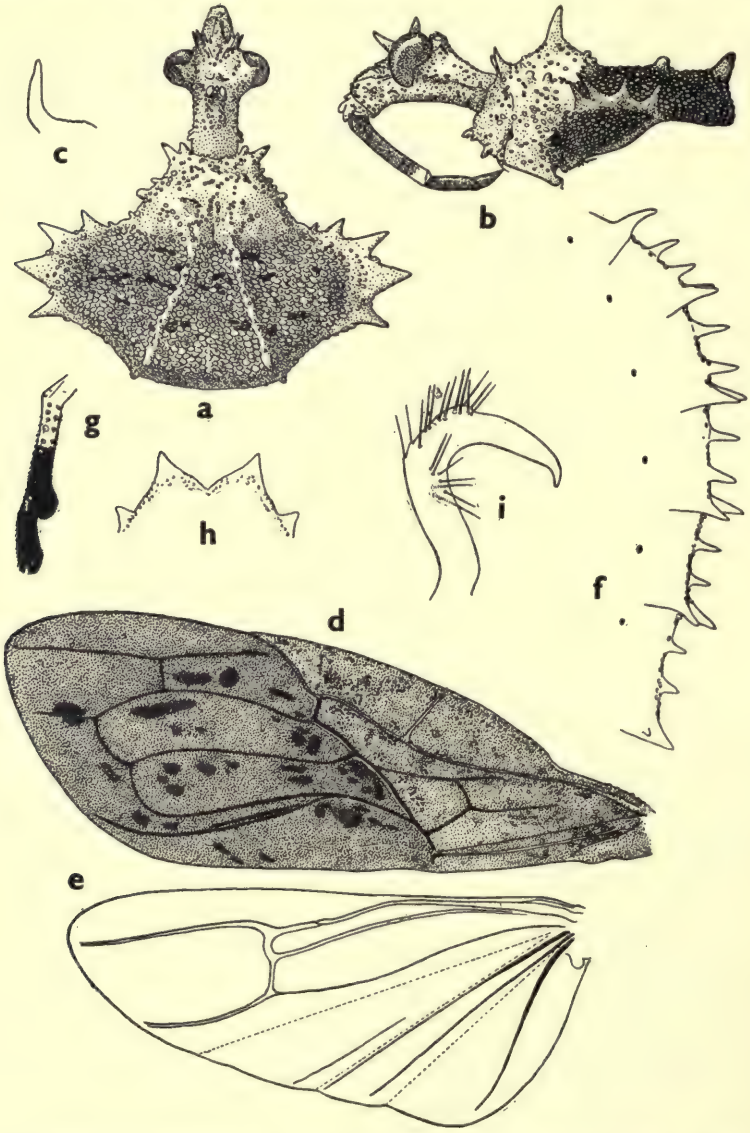

FIG. 5. *Centrocnemis truculenta* sp. n. A. Head and pronotum, (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron ; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia ; H. apex of abdomen, ♂ ; I. harpago.

laterally near posterior margin; segments 3–7 with a similar spot and also an oblique fuscous spot laterally near anterior margin. Connexivum dorsally with faint blackish suffusion. Pleura and abdomen ventrally with strong piceous suffusion and confluent maculation. Prosternum testaceous; meso- and metasternum piceous. Tarsi piceous; anterior tibiae in a little more than half apically, black; tubercles and suffusion in black area whitish; median tibiae broadly black apically and with a blackish median annulation coalescing on outer surface of tibia with black apical part; posterior tibiae broadly black apically and with a very wide median blackish annulation; anterior femora with a little more than half basally piceous; coxae and trochanters piceous.

STRUCTURE. Postocular with a moderately long erect spine laterally adjacent to eyes. Stridulatory furrow fusiform in outline and with well-developed striae. Spiracular osteoles on pro- and mesopleura narrow, elongate. Abdomen dorsally with tubercles of varied sizes irregularly spaced on posterior margin of segments; sub-dorsally with an erect tubercle near each end of gland ostioles, those on segment 3 longer and more widely spaced. Total length 18 mm.

SPECIMEN EXAMINED. One 5th instar neanide. Java (no precise locality).

Centrocnemis polita sp. n.

(Text-fig. 6)

COLOUR. Testaceous. Basal segment of antennae black with white tubercles; segment 2 of antennae blackish brown with pale testaceous tubercles. Lower margin of juga, postocular laterally and gular region of head suffused with brown. Basal segment of rostrum suffused with black; segment 2 black in basal two-thirds; remainder and tubercles whitish; segments 3 and 4 piceous; segment 3 somewhat paler apically. Posterior lobe of pronotum with blackish areas mainly between discal tubercles. Apex of lateral spines on collar and of discal spines on anterior pronotal lobe narrowly brown. Disc of scutellum black; tubercles and laterally dark testaceous; base and apex of spine obscurely testaceous. Corium dark olivaceous; tubercles pale testaceous; venation black, except apex of R and R + M, yellowish; membrane blackish with suffused fuscous spots; metathoracic wings violaceous. Connexivum dorsally with piceous suffusion. Tarsi black; anterior tibiae black in apical two-thirds; tubercles whitish; anterior femora suffused with brown basally; concave lower surface black; median tibiae broadly black apically and with a wide median blackish suffusion; median and posterior femora suffused with piceous basally; posterior tibiae broadly black apically and with a very wide median brownish suffusion. Coxae and trochanters piceous, the anterior and median pair with testaceous suffusion apically.

STRUCTURE. Principal tubercle on basal rostral segment broadly conical, rounded apically. Projections on posterior margin of posterior pronotal lobe short, conical. Connexival segments minutely granulose, the granules fewer in apical half; apical margin of segments with tubercles varying in number and size. Carinae enclosing flattened area of abdomen ventrally very obscurely granulose. Concave part of

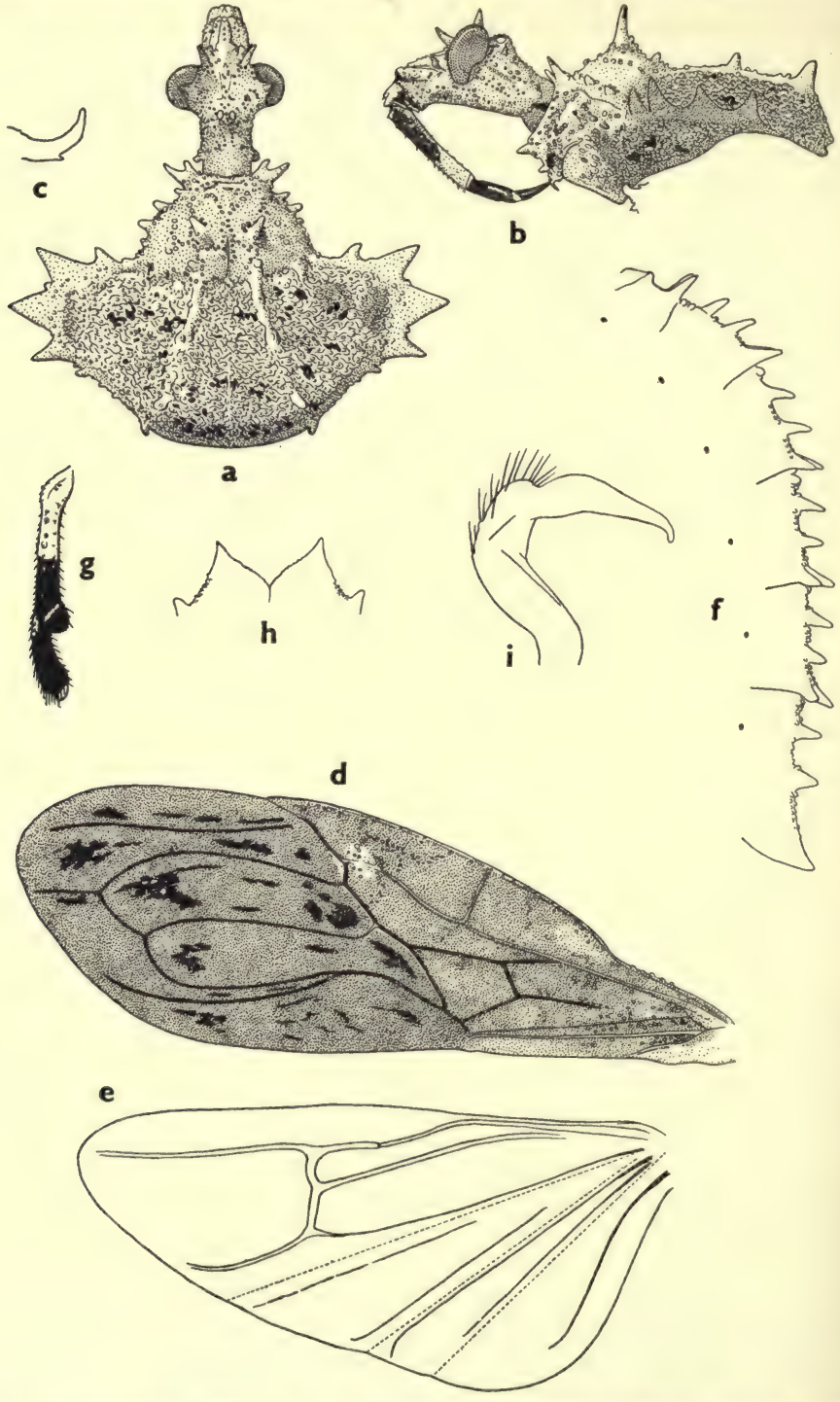

FIG. 6. *Centrocnemis polita* sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia; H. apex of abdomen, ♂; I. harpago.

lower surface of anterior femora with abundant denticles and with a small, median smooth area. Mesosternum with a few low, rounded tubercles.

	♂
Total length	26·00 mm.
Hemelytra	17·00 mm.
Greatest pronotal width	11·00 mm.

SPECIMENS EXAMINED. One ♂ (holotype), C. Borneo, Long Nawang, 1925. (Macgillavry coll., leg. Mjöberg.)

Holotype in Zoologisch Museum. Amsterdam, The Netherlands.

Centrocnemis leprosa sp. n.

(Text-fig. 7)

COLOUR. Greenish testaceous. Basal segment of antennae olivaceous, apically black and with white tubercles; segment 2 blackish with white tubercles and apex narrowly testaceous. Tubercles on head and anterior pronotal lobe whitish; tubercles on posterior lobe testaceous with white apex. Basal segment of rostrum suffused with black; segment 2 black with apex narrowly whitish; tubercles whitish; segments 3 and 4 piceous; segment 3 suffused with brown apically. Gular region black; lower margin of juga and a lateral stripe on postocular dark olivaceous. Propleura blackish with a smooth olivaceous area near upper margin; meso- and metapleura black with a pale testaceous suffusion on acetabula; meso- and metasternum black with median carina and suffusion posteriorly testaceous. Scutellum black with testaceous suffusion at base of apical spine; tubercles pale testaceous. Corium dark olivaceous; apex of clavus suffused with black; tubercles, a median irregular transverse suffusion, apex of R reddish yellow; membrane blackish with fuscous spots; metathoracic wings violaceous. Tarsi black; anterior tibiae black in apical two-thirds and with a whitish spot and tubercles sub-apically; anterior femora pale olivaceous with two pale testaceous stripes on upper surface; base suffused with dark brown; concave area on lower surface black; median femora pale olivaceous with piceous suffusion basally and a pale testaceous sub-oblique stripe on inner surface; posterior femora with basal two-thirds piceous; remainder pale olivaceous; tubercles and spines pale testaceous; coxae and trochanters piceous; tubercles on coxae pale testaceous.

STRUCTURE. Principal tubercles on basal rostral segment conical, narrowly rounded apically. Projections on posterior margin of posterior pronotal lobe very short, rounded, tuberculate. Connexival segments minutely granulose dorsally; apical margin of segments with a few erect tubercles of varied lengths. Carinae enclosing flattened area of abdomen ventrally distinct, moderately granulose. Concave part of lower surface of anterior femora with abundant denticles and with a parallel-sided median, smooth area. Metasternum with a few tubercles.

	♂	♀
Total length	22·00 mm.	25·00 mm.
Hemelytra	14·00 mm.	17·00 mm.
Greatest pronotal width	8·50 mm.	11·00 mm.

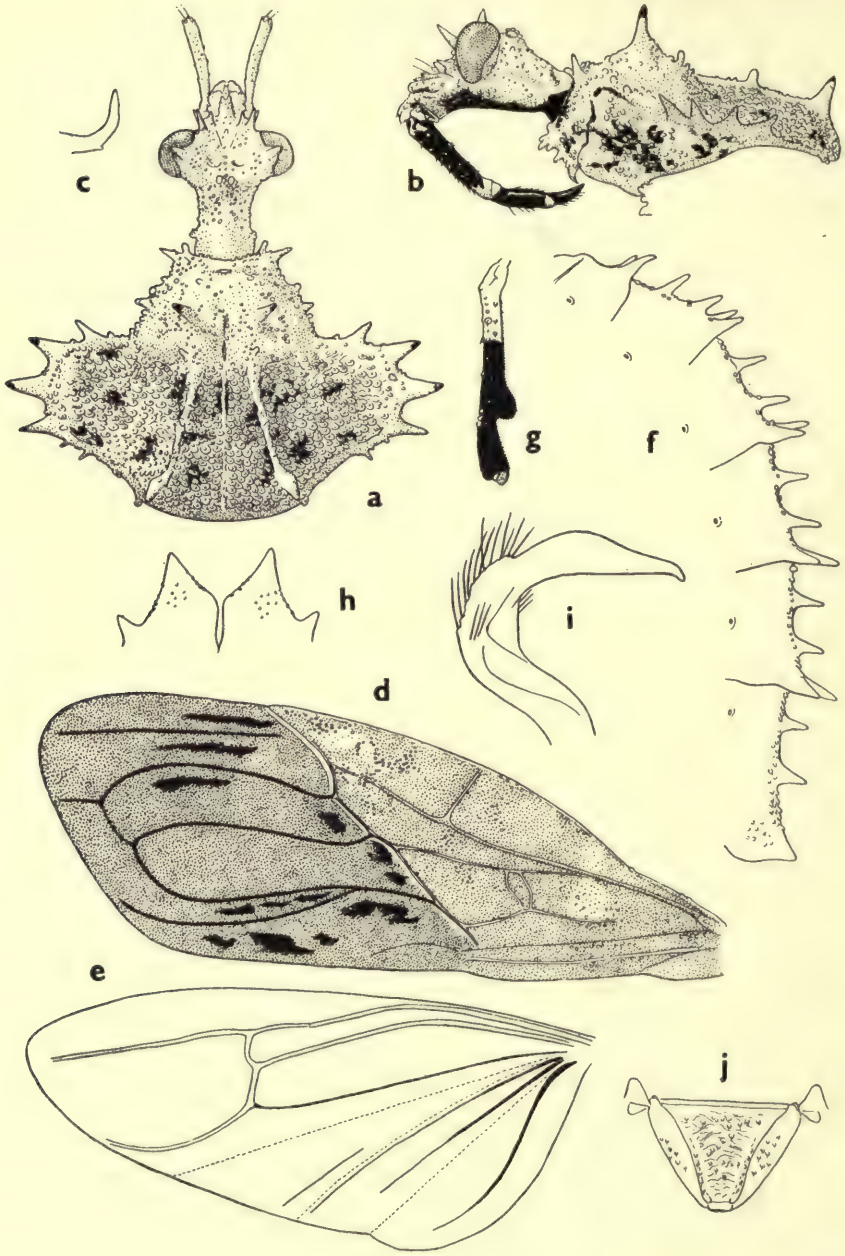

FIG. 7. *Centrocnemis leprosa* sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia; H. apex of abdomen, ♂; I. harpago; J. apex of abdomen, ♀.

SPECIMENS EXAMINED. One ♂ (holotype), Java, Gunong Slamet, Batoerraden, 18.i.1929; 2 ♂♂, 1 ♀ (paratypes), same locality, 21.x.1928, 18.i.1929; 1 ♀ (paratype), 18.i.1929; 3 5th instar neanides. F. C. Drescher (coll. D. Macgillavry).

Holotype ♂, 1 ♂ and 1 ♀ paratype, 2 5th instar neanides in Zoologisch Museum, Amsterdam, The Netherlands; 1 ♂ paratype and 1 5th instar neanide in British Museum (Nat. Hist.), London.

5th instar neanide. (Text-fig. 2, A)

COLOUR. Testaceous. Basal segment of antennae blackish with a median suffusion and apex of tubercles greenish white; segments 2–4 blackish with whitish tubercles; apex of segment 2 moderately broadly white. Tubercles on head and anterior pronotal lobe white. Apex of lateral spines on collar, of discal tubercles and lateral spines of anterior pronotal lobe narrowly brown. Both lobes of pronotum, rudimentary hemelytra and wings with black and brown suffusion. Gula piceous, shining basally; anteocular and postocular dorsally laterally with greenish black suffusion. Basal segment of rostrum suffused with black; segment 2 black with apex and tubercles whitish; segments 3 and 4 black; segment 3 with light brown suffusion apically. Pleura, meso- and metasternum strongly suffused with black, the former with testaceous spots and tubercles, the latter with the median carina testaceous. Abdomen dorsally with strong black confluent maculation, large pale and deep yellow spots on connexivum and very small, pale yellow spots and fuscous spots sub-laterally. Area surrounding gland ostioles deep yellow; abdomen ventrally with strong black suffusion and confluent spots. Tarsi piceous; anterior tibiae with apical two-thirds black and with a pale suffused testaceous spot on outer surface sub-apically; median tibiae black apically and with a median blackish suffusion; posterior tibiae broadly black apically and with a very wide median annulation blackish; anterior femora with concave lower surface piceous; upper and lateral surfaces suffused with pale olivaceous; median and posterior femora strongly suffused with piceous in basal half; coxae and trochanters piceous.

STRUCTURE. Stridulatory furrow elongate elliptical in outline; transverse striae well-developed. Rudimentary scutellum with a short, erect spine. Abdomen dorsally with an erect tubercle on each side of gland ostioles. Pro- and mesopleural spiracles with a narrow elongate ostiole. Rudimentary *fossula spongiosa* on anterior and median tibiae composed of a very dense group of short, slender setae. Total length 20 mm.

SPECIMENS EXAMINED. Three 5th instar neanides (same data as for adults).

Centrocnemis malayana sp. n.

(Text-fig. 8)

COLOUR. Testaceous except scutellum, black. Basal segment of antennae blackish with tubercles and a narrow longitudinal stripe on upper surface testaceous; segment 2 blackish with tubercles and a very narrow sub-apical annulation pale testaceous. Posterior lobe of pronotum with faint black suffusion. Propleural epimeron, meso- and metapleura with piceous suffusion. Meso- and metasternum piceous; median

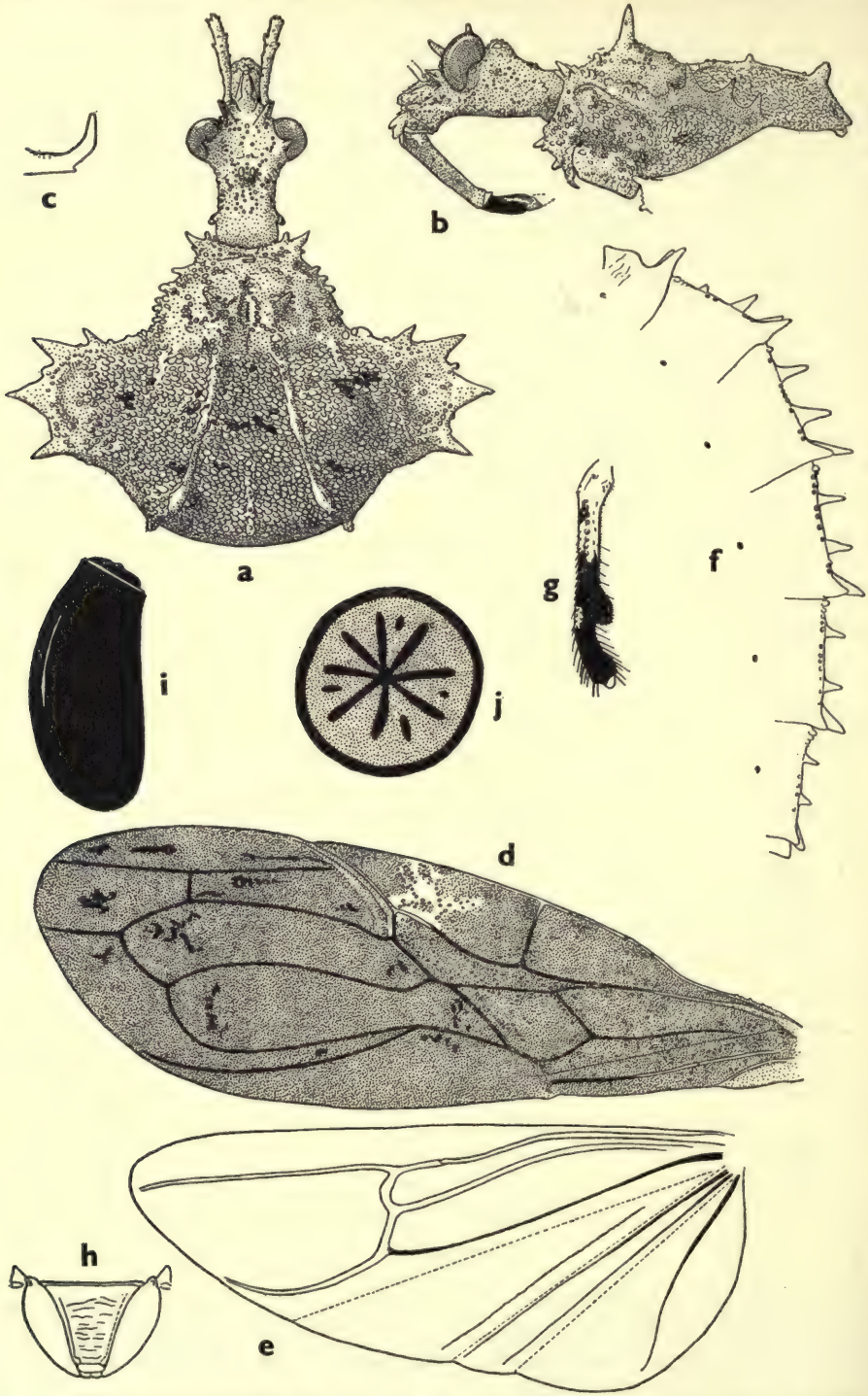

FIG. 8. *Centrocnemis malayana* sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia; H. apex of abdomen, ♀; I. ovum; J. operculum.

carina testaceous. Scutellum with basal lateral spines, tubercles and an annulation at base of apical spine pale testaceous. Corium dark olivaceous with a suffusion medially and sub-apically and tubercles whitish ; apical half of clavus suffused with black ; membrane greyish with paler grey and fuscous confluent spots ; metathoracic wings violaceous ; vein R and base of Cu reddish. Tarsi black ; anterior tibiae with a little less than two-thirds apically black with a well-defined pale testaceous spot on outer surface sub-apically ; anterior femora with concave part of lower surface piceous ; upper surface with a longitudinal paler testaceous stripe ; median and posterior femora strongly suffused with piceous ; median tibiae piceous apically and with a median brownish suffusion on outer surface ; posterior tibiae broadly black apically and remainder, except base, broadly suffused with black.

STRUCTURE. Basal segment of antennae with many setigerous tubercles ; segment 2 with a few tubercles, mainly in basal half. Principal tubercles on basal rostral segment conical, somewhat broadly rounded apically. Projections on posterior margin of posterior pronotal lobe very short, rounded, tuberculate. Connexival segments moderately granulose ; apical margin of segments with tubercles varying in number and size. Carinae enclosing flattened area of abdomen ventrally moderately well-defined, obscurely granulose. Concave part of lower surface of anterior femora with abundant denticles and a well-defined smooth median area.

	♀
Total length	27·50 mm.
Hemelytra	19·00 mm.
Greatest pronotal width	12·00 mm.

SPECIMENS EXAMINED. One ♀ (holotype), Malacca (no precise locality : probably not the colony of Malacca is intended but Malaya) ; one ♀ (paratype) Malacca (no precise locality ; also probably Malaya), 1862, Castelnau.

Holotype in Naturhistoriska Riksmuseum, Stockholm, Sweden ; paratype in Hope Department, University of Oxford, England.

Ovum (Text-fig. 8, i). Cylindrical, somewhat curved at upper end ; chorion glabrous, very obscurely reticulate ; chorion piceous ; differentiated portion whitish ; opercular ridges piceous. 3.50 mm.

Centrocnemis suprema sp. n.

(Text-fig. 9)

COLOUR. Testaceous. Tubercles on head and thorax mostly white. Basal segment of antennae strongly suffused with black and with whitish tubercles ; segment 2 blackish, narrowly whitish apically. Basal segment of rostrum suffused with black ; segment 2 blackish with an elongate spot basally laterally ; apex narrowly and tubercles whitish ; segments 3 and 4 piceous ; segment 3 suffused with brown apically. Gula piceous ; lower margin of juga suffused with black ; postocular laterally and with an oblique stripe sub-laterally blackish. Posterior lobe of pronotum with black areas ; lateral spines on collar, discal tubercles on anterior pronotal lobe narrowly brown apically. Scutellum piceous ; tubercles, basal lateral spines

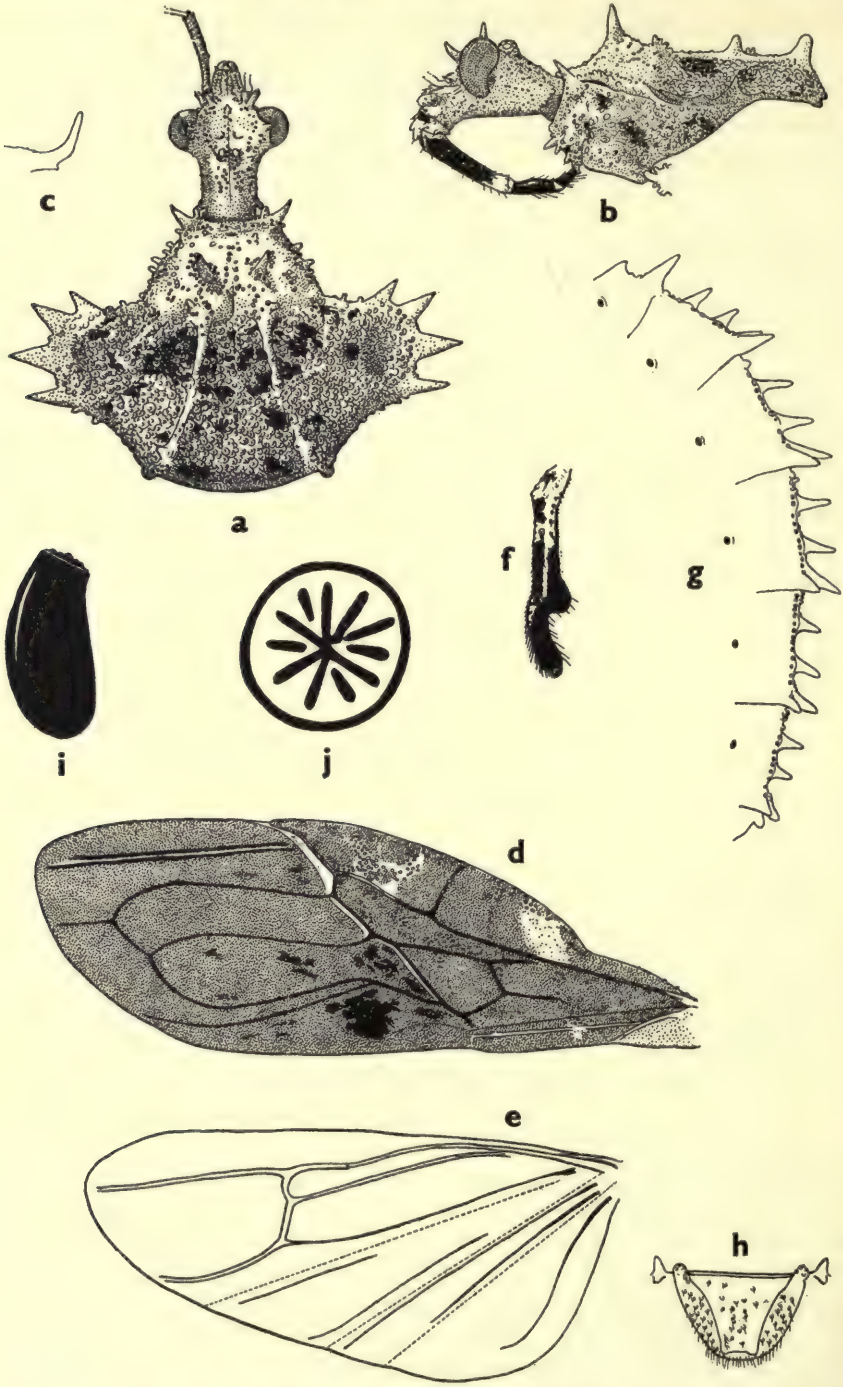

FIG. 9. *Centrocnemis suprema*, sp. n. A. Head and pronotum (dorsal view); B. head, pronotum, and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing, F. anterior tibia; G. connexivum (ventral view); H. apex of abdomen, ♀; I. ovum; J. operculum.

and an annulation at base of apical spine testaceous. Propleura suffused with piceous; meso- and metapleura piceous with testaceous suffusion on acetabula. Corium dark olivaceous; medially and apically with a pale pinkish testaceous suffusion; apex of vein R pinkish testaceous; membrane dark grey with fuscous spots; metathoracic wings faintly violaceous; vein R light red. Connexival segments pale testaceous with dark brown suffusion; abdomen dorsally ferruginous; ventrally strongly suffused with piceous and with a wide, median, longitudinal piceous stripe. Tarsi black; anterior tibiae with apical two-thirds black and with a pale testaceous spot on outer surface sub-apically and on inner surface of spur; tubercles pale testaceous; median tibiae broadly black apically; remainder suffused with black; posterior tibiae black, except basally and a sub-apical annulation, testaceous; basal testaceous part with a lateral black stripe; anterior femora with lower, and lower lateral, surface black; external surface with a longitudinal blackish suffusion.

STRUCTURE. Principal tubercles on basal rostral segment conical, narrowly rounded apically. Projections on posterior margin of posterior pronotal lobe very short, broadly rounded. Connexival segments with abundant granules, the largest near the base; apical margin of segments with sub-erect apically rounded tubercles of varied sizes. Carinae enclosing flattened area of abdomen ventrally moderately distinct and granulose. Concave part of lower surface of anterior femora with moderately abundant denticles and an irregular smooth median area.

	♀
Total length	26·50 mm.
Hemelytra	16·50 mm.
Greatest pronotal width	11·00 mm.

SPECIMENS EXAMINED. One ♀ (holotype), Java, Koelangkangkoen 17.viii.1927, F. C. Drescher (coll. D. Macgillavry).

Holotype in Zoologisch Museum, Amsterdam, The Netherlands.

OVUM (Text-fig. 9, i). Cylindrical, somewhat curved at opercular end. Chorion sub-glabrous. Chorion and operculum piceous; differentiated portion of chorion whitish. 3.·50 mm.

Centrocnemis compta sp. n.

(Text-fig. 10)

COLOUR. Dark testaceous. Basal segment of antennae blackish with whitish tubercles; segment 2 brown with apex and tubercles testaceous. Basal segment of rostrum suffused with black; segment 2 black with a triangular spot on inner and lateral surfaces basally, tubercles and apex narrowly whitish; segments 3 and 4 piceous; segment 3 suffused with brown apically. Gula dark brown; extreme base shining piceous; postocular basally laterally piceous; tylus and postocular laterally with dark brown suffusion. Apex of discal tubercles on anterior pronotal lobe very narrowly brown. Posterior lobe of pronotum and propleura with blackish suffusion; meso- and metapleura piceous with very pale testaceous suffusion and tubercles. Scutellum piceous with tubercles and an annulation at base of spine testaceous.

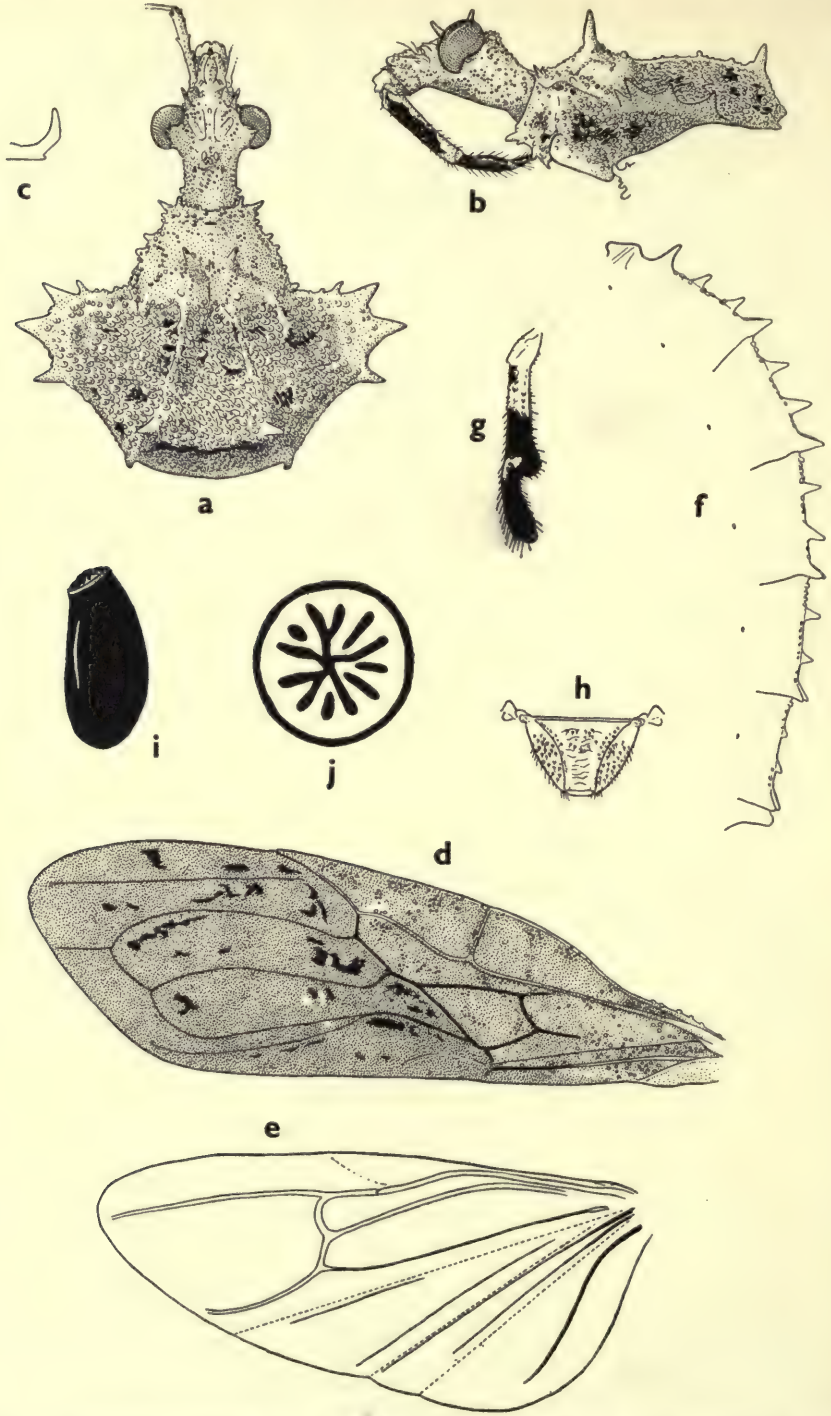

FIG. 10. *Centrocnemis compta* sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia; H. apex of abdomen, ♀; I. ovum; J. operculum.

Corium olivaceous with tubercles and an apical suffusion whitish ; apex of vein R greenish white ; membrane grey with fuscous spots ; metathoracic wings violaceous. Connexival segments with piceous suffusion and a very pale suffused yellowish spot basally ; dorsal surface of abdomen ferruginous ; abdomen ventro-laterally and segment 7 entirely suffused with piceous ; segments 3 and 4 with faint ferruginous suffusion midventrally. Tarsi black ; anterior tibiae with apical two-thirds black and with a pale testaceous spot sub-apically on inner and outer surfaces ; outer surface basally with faint blackish suffusion ; anterior femora with longitudinal brownish suffusion laterally ; concave part of lower surface piceous ; lower surface sub-apically with black suffusion ; median tibiae black apically and with a median brownish suffusion on outer surface ; posterior tibiae blackish, except basally and a somewhat obscure sub-apical annulation, testaceous ; median and posterior femora strongly suffused with piceous, except apically ; coxae and trochanters piceous with pale testaceous suffusion and tubercles.

STRUCTURE. Tubercles on basal antennal segment moderately prominent ; tubercle on upper surface apically short, sub-acute ; segment 2 with a few obscure tubercles basally. Principal tubercles on basal rostral segment conical. Projections on posterior margin of posterior pronotal lobe very short, rounded. Connexival segments dorsally with abundant granules of varied sizes ; apical margin of segments with a few short, curved tubercles. Carinae enclosing flattened area of abdomen ventrally obsolescent. Concave part of lower surface of anterior femora with abundant denticles and a median parallel-sided smooth area.

	♀
Total length	26·50 mm.
Hemelytra	17·00 mm.
Greatest pronotal width	9·50 mm.

SPECIMEN EXAMINED. One ♀ (holotype), Malaya, Doerian, Riouw Archipelago, ix.1923. Dammerman.

Holotype in Rijksmuseum van Natuurlijke Historie Leiden, The Netherlands.

OVUM (Text-fig. 10, i). Cylindrical, curved at opercular end. Chorion sub-glabrous. Chorion and operculum piceous ; differentiated portion of chorion whitish. 3·50 mm.

Centrocnemis sarawakensis sp. n.

(Text-fig. 11)

COLOUR. Dark testaceous. Basal segment of antennae suffused with black apically; segment 2 dark brown. Basal segment of rostrum suffused with black ; segment 2 black with tubercles and apex pale testaceous ; segments 3 and 4 piceous. Tubercles on head, thorax and legs pale testaceous. Scutellar spine medially piceous. Pleura suffused with piceous ; meso- and metasternum piceous ; median carina testaceous. Corium brown with tubercles and an irregular spot apically pale testaceous ; membrane dark greyish with fuscous spots ; metathoracic wings dark infumate with violaceous suffusion ; veins Sc and R reddish. Abdomen ventro-laterally suffused with piceous. Tarsi black ; anterior tibiae with a little more than half apically

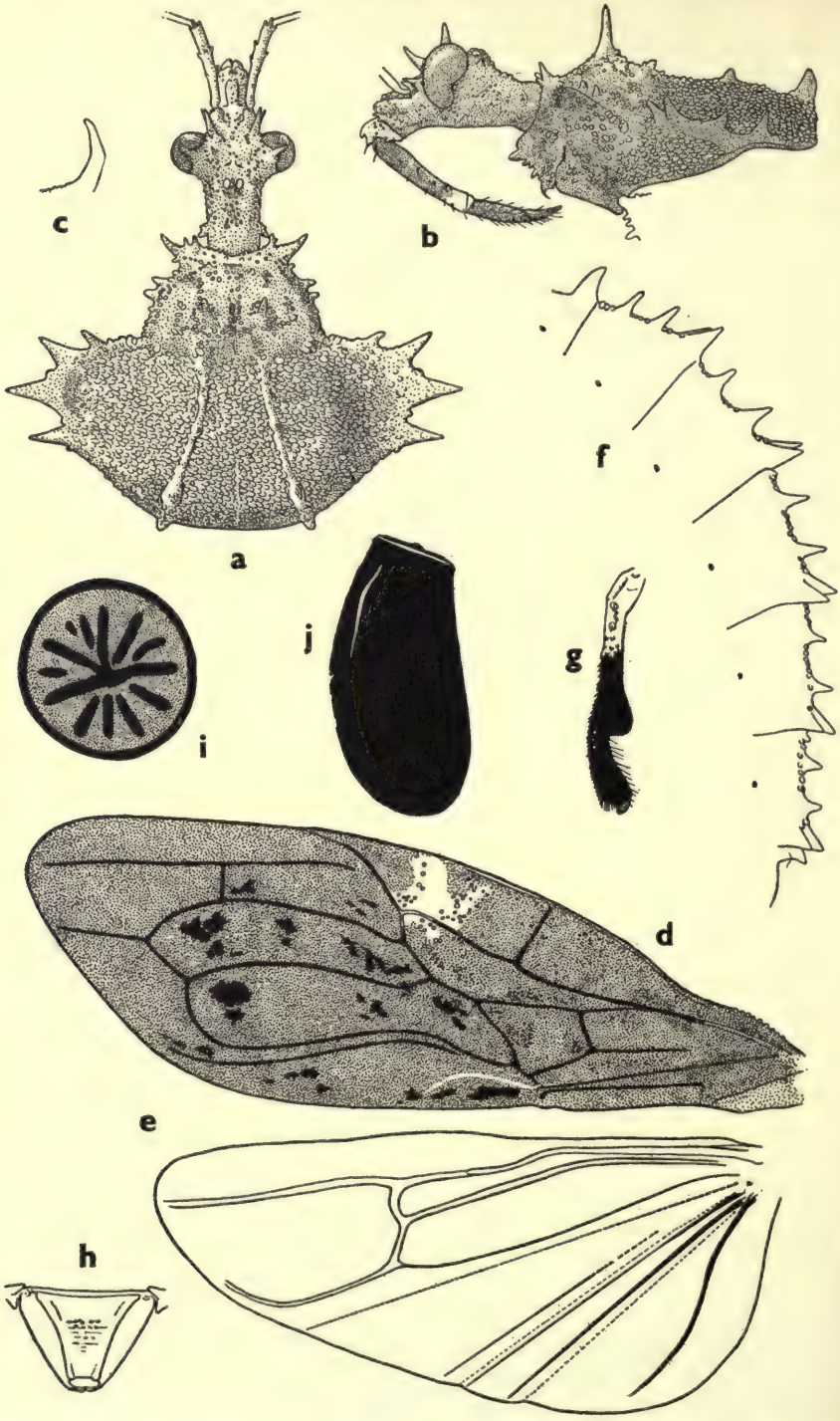

FIG. 11. *Centrocnemis sarawakensis* sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia; H. apex of abdomen, ♀; I. operculum; J. ovum.

black with a pale testaceous spot sub-apically and pale testaceous tubercles; lower surface of anterior femora, greater part of median and posterior femora suffused with piceous; median tibiae broadly black apically and with remainder, except extreme base, brownish; posterior tibiae black, except basally and a sub-apical annulation testaceous; coxae and trochanters piceous; tubercles on coxae pale testaceous.

STRUCTURE. Basal segment of antennae with cylindrical tubercle on upper surface apically and shorter tubercles projecting somewhat, mostly on middle of segment; segment 2 with a few obscure tubercles in basal half. Principal tubercles on basal rostral segment conical narrowly rounded apically. Projections on posterior margin of posterior pronotal lobe short, rounded. Connexival segments strongly granulose dorsally; apical margin of segments thickened with a few short, outwardly directed tubercles. Carinae enclosing flattened area of abdomen ventrally obsolescent and feebly granulose. Concave part of lower surface of anterior femora with moderately abundant denticles and an ill-defined smooth area medially.

	♀
Total length	27·50 mm.
Hemelytra	17·50 mm.
Greatest pronotal width	11·00 mm.

SPECIMEN EXAMINED. One ♀ (holotype), Sarawak (no precise locality). Saunders, B.M., 63—13.

Holotype in British Museum (Nat. Hist.), London.

OVUM (Text-fig. 11, i). Cylindrical, curved on one side and almost straight on other; chorion sub-glabrous; chorion and operculum piceous; differentiated portion of chorion whitish. 3·70 mm.

Centrocnemis cretacea sp. n.

(Text-fig. 12)

COLOUR. Testaceous. Antennae piceous; basal segment with whitish tubercles and a faint median testaceous annulation; segment 2 brownish with whitish tubercles and apex narrowly testaceous. Basal segment of rostrum blackish with pale testaceous or whitish tubercles; segment 2 piceous, narrowly whitish apically and with whitish tubercles; segments 3 and 4 piceous; segment 3 suffused with brown apically. Gula and postocular basally laterally piceous; lower margin of juga suffused with black. Apex of tubercles adjacent to eyes, of lateral spines on collar, of discal tubercles on pronotum and of spines on lateral expansions of posterior pronotal lobe narrowly brown. Propleura suffused with black; meso- and metapleura black with margins of acetabular incision narrowly testaceous. Meso- and metasternum dark testaceous. Scutellum black with basal lateral spines and an annulation at base of apical spine testaceous. Corium olivaceous with black suffusion at apex of clavus and between claval suture and Cu, and irregular pinkish white suffusion medially and apically; apex of R pinkish yellow; metathoracic wings violaceous. Dorsal surface of abdomen light red; abdomen ventrally strongly

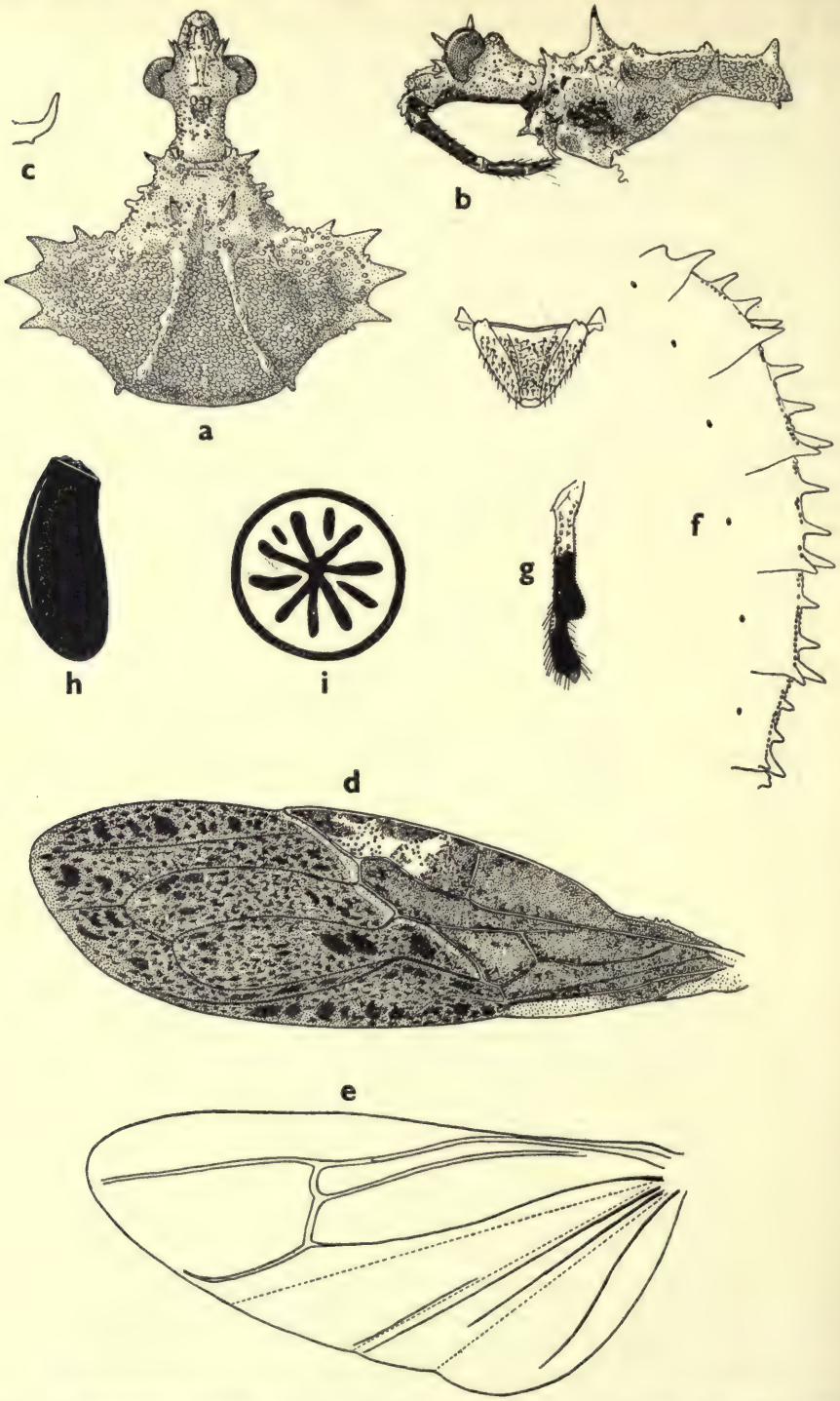

FIG. 12. *Centrocnemis cretacea* sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia; H. ovum; I. operculum.

suffused with piceous. Tarsi black; anterior tibiae black in apical two-thirds and with whitish spot and tubercles sub-apically; median tibiae black, except basally and a narrow area on inner surface testaceous; posterior tibiae broadly black apically; remainder, except basally, brownish with pale testaceous tubercles; coxae and trochanters piceous; anterior coxae narrowly testaceous apically; anterior and median femora with piceous suffusion basally; posterior femora piceous except apex testaceous.

STRUCTURE. Basal segment of antennae with very short tubercle on upper surface apically and with very short tubercles mostly medially; segment 2 with a few obscure tubercles in basal half. Principal tubercles on basal rostral segment conical, narrowly rounded apically. Projections on posterior margin of posterior pronotal lobe short, narrowly conical. Connexival segments strongly and minutely granulose dorsally; apical margin of segments with a few tubercles. Carinae enclosing flattened area of abdomen ventrally obsolescent. Concave part of lower surface of anterior femora with abundant denticles and with a median, parallel-sided smooth area.

	♀
Total length	25·00 mm.
Hemelytra	17·50 mm.
Greatest pronotal width	9·00 mm.

SPECIMENS EXAMINED. One ♀ (holotype), one ♀ (paratype), Java, Mount Salak, 800 m., 2.viii.1928. L. G. E. Kalshoven.

Holotype in Zoologisch Museum. Amsterdam, The Netherlands, paratype in British Museum (Nat. Hist.), London.

OVUM (Text-fig. 12, H). Cylindrical somewhat strongly convex on one side and feebly convex on other at opercular end; chorion glabrous, obscurely rugulose, obscurely reticulate basally; chorion and operculum piceous; differentiated portion of chorion whitish. 4 mm.

Centrocnemis neglecta sp. n.

(Text-fig. 13)

COLOUR. Testaceous. Basal and segment 2 of antennae blackish with whitish tubercles; basal segment also with testaceous suffusion medially. Basal segment of rostrum suffused with black; segment 2 piceous, except inner surface basally and narrowly apically whitish; segments 3 and 4 piceous; segment 3 suffused with brown apically. Gula dark brown; extreme base of postocular laterally and ventrally shining piceous; lower part of juga with black suffusion; postocular laterally with brown suffusion. Posterior lobe of pronotum with greyish areas; lateral spines on collar and discal tubercles on anterior pronotal lobe brown apically. Propleura with faint blackish suffusion; meso- and metapleura piceous with obscure testaceous suffusion. Scutellum black; basal lateral spines, tubercles, an annulation at base of apical spine, apex of spine, testaceous. Meso- and metasternum suffused with piceous; median carina testaceous. Corium olivaceous with blackish suffusion and with a

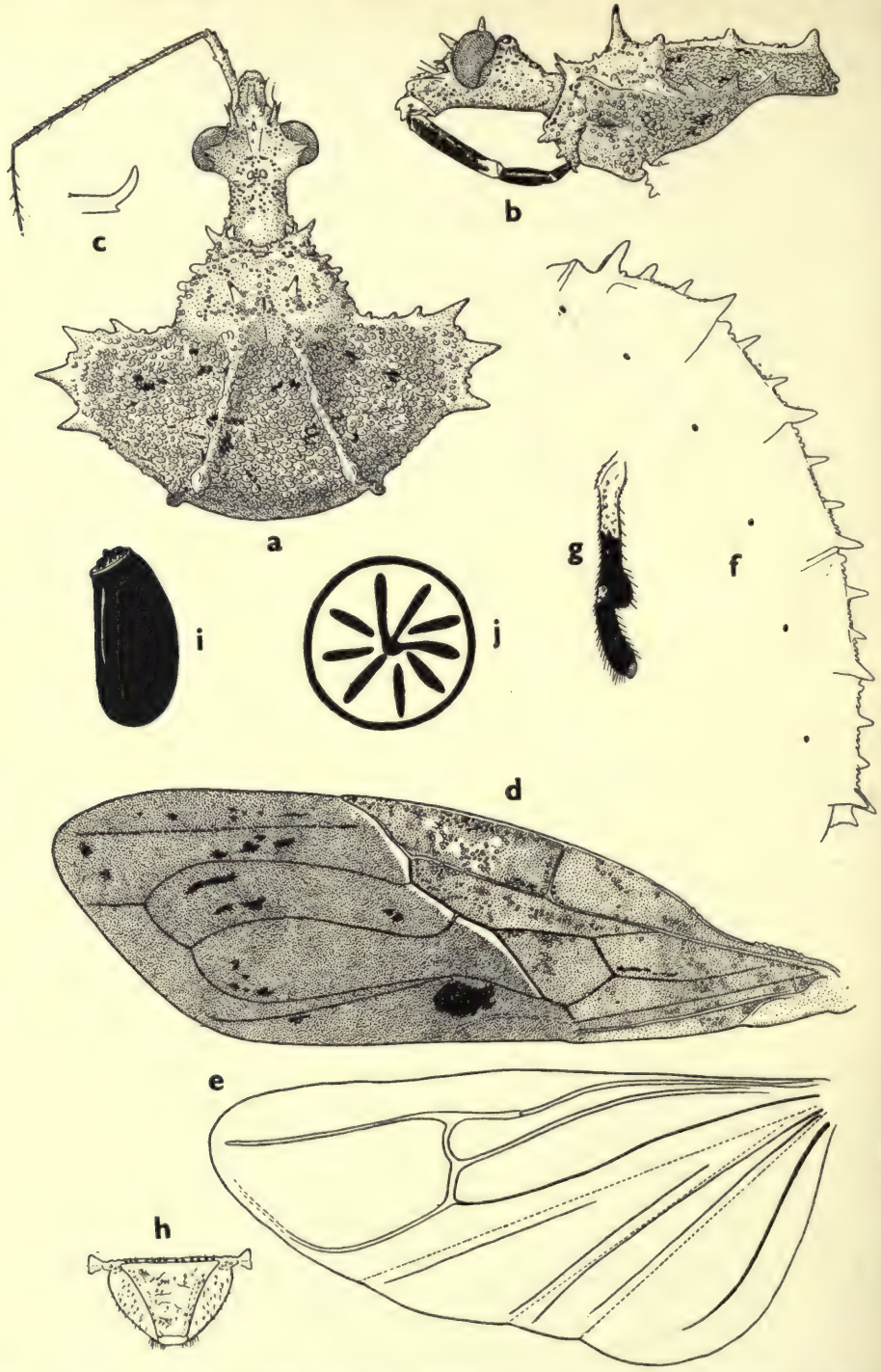

FIG. 13. *Centrocnemis neglecta* sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. anterior tibia; H. apex of abdomen, ♀; I. ovum; J. operculum.

suffused spot apically and apex of vein R greenish white ; membrane dark greyish with fuscous and pale grey spots ; metathoracic wings violaceous. Connexivum pale testaceous with piceous suffusion ; abdomen ventrally dark yellowish with piceous suffusion. Tarsi black ; anterior tibiae with anterior two-thirds black and pale testaceous tubercles on outer surface sub-apically ; median tibiae with apex broadly black and a wide blackish suffusion on outer surface medially ; posterior tibiae black, except basally ; anterior femora with concave part of lower surface piceous ; median femora strongly suffused with piceous, except on inner surface ; posterior femora suffused with piceous in a little more than half basally ; coxae and trochanters piceous, the anterior pair of the former with testaceous suffusion.

STRUCTURE. Longer tubercles on basal antennal segment moderately prominent. Principal tubercles on basal rostral segment conical narrowly rounded apically. Projections on posterior margin of posterior pronotal lobe short, broadly rounded, tuberculate. Connexival segments dorsally with abundant granules ; apical margin of segments with a few outwardly directed, short, rounded tubercles of varied sizes. Carinae enclosing flattened area of abdomen ventrally obsolescent. Concave part of lower surface of anterior femora with abundant denticles and a distinct, parallel-sided median smooth area.

	♀
Total length	28·50 mm.
Hemelytra	19·00 mm.
Greatest pronotal width	12·00 mm.

SPECIMEN EXAMINED. One ♀ (holotype), Borneo, Kina Balu (coll. Breddin).

Holotype in Deutsches Entomologisches Institut, Berlin, Germany.

OVUM (Text-fig. 13, i). Cylindrical, considerably narrower at opercular end. Chorion sub-glabrous; piceous ; operculum dark testaceous with carinae piceous ; differentiated portion of chorion whitish. 3·60 mm.

Neocentrocnemis gen. nov.

Basal segment of antennae shorter than anteocular ; segment 2 much longer than basal segment. Anteocular considerably shorter than postocular. Segment 2 of rostrum somewhat thick, sub-equal in length to segments 3 and 4 together. Connexival segments with a variable number of spines at external apical angle. Anterior tibiae simple ; anterior and median tibiae with a *fossula spongiosa*. Scutellum with an erect spine apically. Metathoracic wings infumate.

Type Species *Centrocnemis signoreti* Stål

Key to *Neocentrocnemis* species (males)

1. External apical angle of connexival segments 2 and 3 with 2 spines ; segments 4–6 with 1 spine . . . . . 2.
–. External apical angle of connexival segments 2–6 with 2 spines . . . . . 7.

2. Posterior lobe of pronotum with distinct transverse carinae . . . *ståli* (Reuter).
–. Posterior lobe of pronotum without distinct carinae . . . . . 3.
3. External apical spine on connexival segments acutely triangular, somewhat broad *signoreti* (Stål).
–. External apical spine on connexival segments acutely triangular, very narrow . 4.
4. Corium dark brown with white spotted, black venation . . *fuscipennis* sp. n.
–. Corium greyish with white venation . . . . . 5.
5. Spines at lateral angle of collar slender, acute . . . *formosana* (Matsumura).
–. Spines at lateral angle of collar thick, conical . . . . . 6.
6. Anterior pronotal tubercles conical, tuberculate around base. . . *roepkei* (Miller).
–. Anterior pronotal tubercles cylindrical without tubercles around base *palawanica* sp. n.
7. Connexival spines very long, slender; scutellar spine moderately thick, oblique, acute apically . . . . . *philippinensis* (Distant).
–. Connexival segments moderately long, very slender; scutellar spine sub-vertical, acute apically . . . . . *semiarmata* sp. n.

Key to *Neocentrocnemis* species (females).

1. External apical angle of connexival segments 2 and 3 with 2 spines; segments 4–7 with 1 spine . . . . . 2.
–. External apical angle of connexival segments 2–6 with 2 spines; segment 7 with 1 spine . . . . . 10.
2. Spine at external apical angle of connexival segments 4–6 very broadly triangular, somewhat rounded apically; spine on segment 7 lobate . *kinabuluensis* sub. sp. n.
–. Spine at external apical angle of connexival segments 4–6 not broadly triangular; spine on segment 7 not lobate . . . . . 3.
3. Tubercles on corium rounded, distinct and relatively few . . . *signoreti* (Stål).
–. Tubercles on corium conical, abundant . . . . . 4.
4. Scutellar spine short, erect, narrowly conical . . . . . *elliptica* sp. n.
–. Scutellar spine short, erect, broadly conical . . . . . 5.
5. Discal tubercles on anterior pronotal lobe narrowly conical, feebly tuberculate basally posteriorly . . . . . *palawanica* sp. n.
–. Discal tubercles on anterior pronotal lobe cylindrical, strongly tuberculate basally posteriorly . . . . . 6.
6. Discal tubercles on posterior pronotal lobe very short . . . . . 7.
–. Discal tubercles on posterior pronotal lobe moderately long, narrowly conical . . 9.
7. Anterior lobe of pronotum with two short conical tubercles in front of discal tubercles *roepkei* (Miller).
–. Anterior lobe of pronotum with two moderately long tubercles in front of discal tubercles . . . . . 8.
8. Lateral margins of anterior pronotal lobe somewhat obscurely tuberculate *fuscipennis* sp. n.
–. Lateral margins of anterior pronotal lobe with short conical tubercles *formosana* (Matsumura).
9. Transverse carinae on posterior pronotal lobe distinct . . . *ståli* (Reuter).
–. Transverse carinae on posterior pronotal lobe not distinct . . . *celebensis* sp. n.
10. Veins of corium with abundant, very narrowly conical tubercles . *macgillavryi* sp. n.
—. Veins of corium with sparse very narrowly conical tubercles . . . . . 11.
11. Spines on head and connexivum very long . . . . *philippinensis* (Distant).
—. Spines on head and connexivum relatively shorter . . . . . 12.
12. Lateral spines on collar, apical scutellar spine long, slender acute . . *semiarmata* sp. n.
—. Lateral spines on collar conical; apical scutellar spine short, acute . . *impavida* sp. n.

Neocentrocnemis signoreti (Stål)

(Text-fig. 14)

1863, *Ann. Soc. ent. Fr.* 48.

Colour. Pale testaceous. Segment 2 of antennae brown, very narrowly testaceous basally. Confluent spots on anterior and posterior pronotal lobe, apex of discal tubercles, apex of lateral expansions, confluent spots on propleura, black. Abdomen ventrally mainly black; intermediate spines on segment 2 of connexivum black. Corium very pale testaceous with strong black suffusion; tubercles very pale testaceous; membrane brown with whitish confluent spots and fuscous suffusion basally; metathoracic wings infumate; venation darker; vein M mostly yellow suffused with light red apically. Tarsi black with testaceous suffusion on segment 2 apically and segment 3 basally; tibiae with apex and a wide median annulation black; anterior femora with faint brownish suffusion basally; median femora black with base, apex and a median suffusion testaceous.

Structure. Principal tubercles on basal rostral segment trapeziform with apical angles rounded. Projections on posterior margin of posterior pronotal lobe obsolescent, rounded. Carinae enclosing flattened area of abdomen ventrally obsolescent; (in male distinct and granulose on segment 3, less distinct on other segments).

	♂	♀
Total length	24·50–27·00 mm.	25·00–28·00 mm.
Hemelytra	16·50–17·00 mm.	16·00–17·50 mm.
Greatest pronotal width	9·50–11·00 mm.	10·00–12·00 mm.

Specimens examined. One ♂ (paratype), Sarawak; 1 ♂, S. Sumatra, S.W. Lampongs, Mt. Tanggamoes Giesting, 600 m., 12.1934, Lieftinck/Toxopeus; 1 ♂, W. Sumatra, Padang Pandjang, H. Rolle; 1 ♂, Malacca, 1862, Castelnau; ♂, Malacca 1965, Deyrolle; 1 ♂, Sarawak A. R. Wallace. (B.M. 56–44); 2 ♂♂, Sarawak, Mt. Poi, E. Mjöberg, (Mt. Poi Exped), (B.M., 1947–269); 1 ♂, Sarawak, Saunders, (B.M., 65–13); 1 ♂, Borneo (B.M., 1953–629; pres. by Perth Museum); 1 ♂, Sumatra (Distant coll., B. M., 1911–383); 1 ♂, Malaya, nr. Karak, Chintamani, Pahang, (at light), 15.viii.1935, (pres. by Selangor Museum); 2 ♂♂, Sarawak, Kuching, 21.i.1900, R. Shelford; 1 ♂, Sarawak, Mt. Kalulong 10.xi.1932, B.M., Hobby and A. W. Moore, Oxford Univ. Exped. (B.M., 1933–254); 2 ♂♂, Sarawak, Mt. Matang, 20.i.1914, G. E. Bryant; 1 ♀ (holotype), Sarawak; 1 ♀ Malaya, Perak, Doherty, (Distant coll; B.M., 1911–383); 2 ♀♀, Sarawak, Mt. Poi, E. Mjöberg; 3 ♀♀, Sarawak foot of Mt. Dulit, junction of Rivers Tinjar and Lejok, 10.ix.1932, B.M. Hobby and A. W. Moore, Oxford Univ. Exped. (B.M., 1933–254); 2 ♀♀, Sarawak, Mt. Matang, 10.xi.1914, G. E. Bryant; 1 ♀, Sarawak, Mt. Kalulong, 10.xi.1932, B.M., Hobby and A. W. Moore, Oxford Univ. Exped. (B.M., 1933–254); 1 ♀, Sarawak, Kuching, R. Shelford; 1 ♀, Sarawak, Kuching 23.vi.1899, (Distant coll., B.M., 1911–383); 1 ♀, Sarawak Long Lebang, 28.x.1932, B. M. Hobby and A. W. Moore, Oxford Univ. Exped. (B.M., 1933–254); 1 ♀, Malacca, 1 ♀, Malacca, 1862, Castelnau; 1 ♀, S.O. Borneo (coll Breddin); 1 ♀, Sumatra, Loeboek Sikaping, 450 m., 1923–27, L. Hundeshagen.

FIG. 14. *Neocentrocnemis signoreti* (Stål) gen. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. harpago; H. apex of abdomen, ♂; I. *idem*, ♀; J. ovum; K. operculum.

Holotype in British Museum (Nat. Hist.) London ; paratype in Naturhistoriska Ricksmuseum Stockholm, Sweden.

Ovum. (Text-fig. 14, J). Sub-ampulliform. Chorion sub-glabrous, minutely reticulate ; chorion and operculum piceous ; differentiated portion of chorion whitish 2·70 mm.

2nd instar neanide (Text-fig. 2, C)

Colour. Testaceous. Anterior margin of pronotum, apex of pronotal spines broadly, transverse suffusion and confluent spots on segments 1–3 and 5–6 of abdomen dorsally black. Tarsi testaceous with apical segment suffused with black ; anterior and median tibiae with apex and a median annulation black ; posterior tibiae, except base, narrowly black ; anterior femora piceous on lower surface basally ; median and posterior femora piceous, except apically ; coxae piceous with testaceous suffusion ; trochanters testaceous ; Sterna piceous. Connexival spines apically black.

Structure. All spines very long and with short lateral spines and tubercles, most of which setigerous. Striae in stridulatory furrow well-developed. Abdomen sub-dorsally with a pair of erect tubercles near gland ostioles, the tubercles on segment 3 longer and more widely spaced. Total length 7·50 mm.

3rd instar neanide (Text-fig. 2, D)

Closely resembles the 2nd instar, but differs in having the spines considerably shorter, more robust and without or with much reduced lateral setigerous tubercles. Sub-dorsal abdominal tubercles on segments 4 and 5 relatively shorter and thicker. Striae in stridulatory furrow well-developed. Total length 10 mm.

4th instar neanide (Text-fig. 2, E)

Somewhat paler in coloration than the 3rd instar and with less black suffusion and confluent maculation on abdomen dorsally. In this instar the spines are relatively more robust, those on the pronotum directed forwards and not erect. Striae in stridulatory furrow well-developed. Tylus with long tubercles. Total length 14·50 mm.

5th instar neanide (Text-fig. 2, F)

Differs from the 4th instar mainly in the greater extent of development of the hemelytra and wings, the margins of which have moderately robust spines. The tylus has much shorter tubercles and the spine at the external apical angle of the connexival segments is acutely triangular, but much wider basally. The *fossula spongiosa* are represented by a dense group of short setae which cover a larger area on the median than on the anterior tibiae. Total length 19–21 mm.

Specimens examined. Two 2nd instar, 2 3rd instar, 4 4th instar and 2 5th instar neanides N. Borneo (Sarawak), Kuching R. Shelford ; 1 5th instar, Sarawak, foot, of Mt. Dulit junction of the Rivers Tinjar and Lejok 10.ix.1932, B. M., Hobby and A. W.Moore, Oxford Univ. Exped.; 1 5th instar, Sarawak (no precise locality), Saunders (B.M., 65–13) ; 1 5th instar Borneo (no precise locality) (pres. by Perth Museum ; B.M., 1953–629).

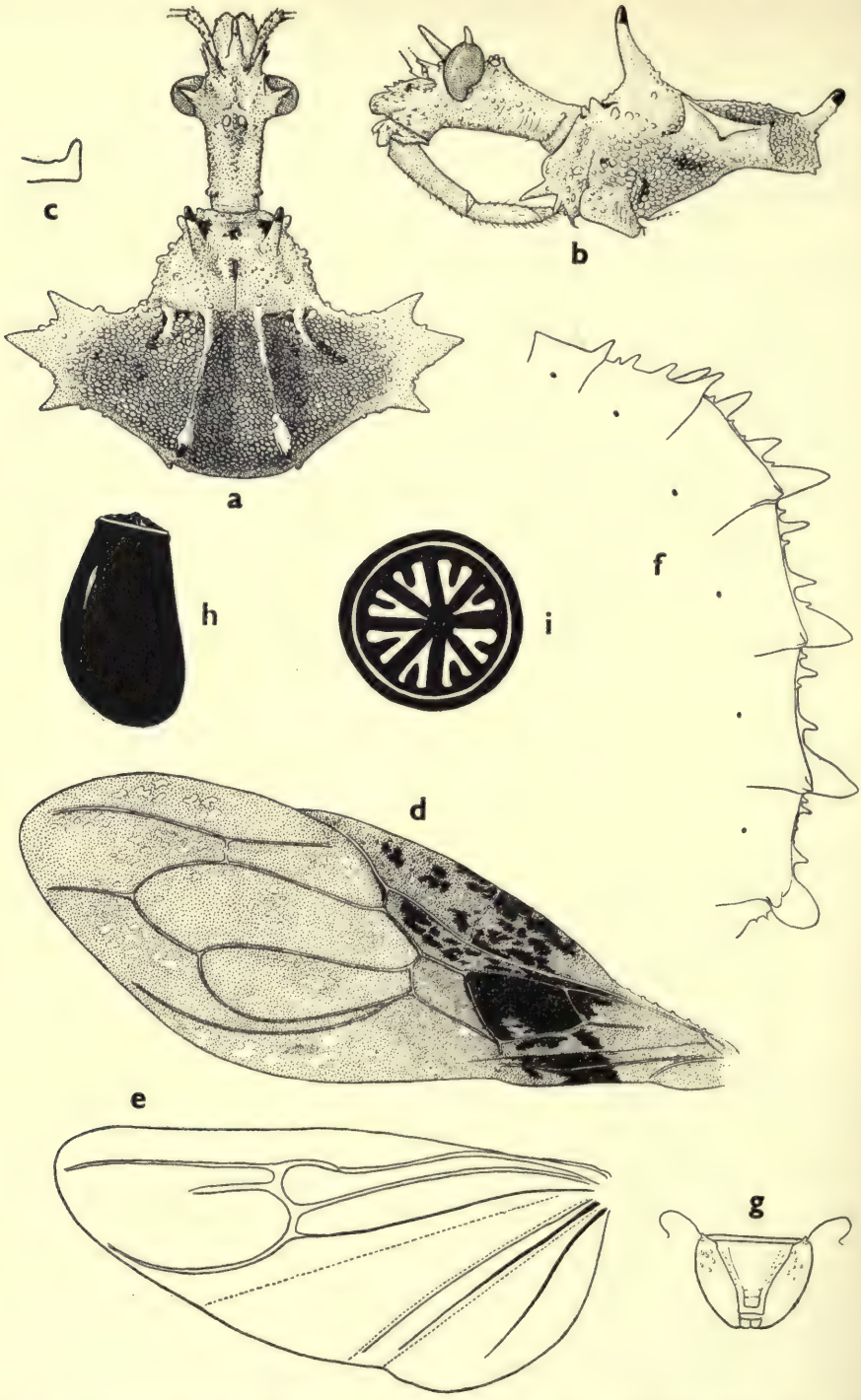

FIG. 15. *Neocentrocnemis kinabaluensis* gen. n., subsp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♀, H. ovum; I. operculum.

Neocentrocnemis kinabaluensis sub-sp.n.

(Text-fig. 15)

Differs from *Neocentrocnemis signoreti* (Stål) in larger size, and in having much more robust and backwardly directed sub-dorsal tubercles and less pronounced sub-dorsal carinae on posterior pronotal lobe, rounded and not acute basal lateral spines on scutellum, somewhat obscurely tuberculate pronotal lobes, less strongly tuberculate and spinose femora and very wide spine at external angle of connexival segments.

	♀
Total length	27·50 mm.
Hemelytra	17·00 mm.
Greatest pronotal width	11·00 mm.

1 ♀ (holotype), Borneo, Kina Balu, Whitehead. (Distant coll., B.M., 1911–383). Holotype in British Museum (Nat.Hist.) London.

Ovum, (Text-fig. 15, h). Cylindrical, narrower at opercular end; rounded on one side, straight on other. Chorion sub-glabrous. Chorion and carinae on operculum piceous; differentiated portion of chorion whitish. 2·70 mm.

Neocentrocnemis formosana (Matsumura)

(Text-fig. 16)

1913, *Thous. Ins. Japan, Addit.* 1, 161.

Colour. Dark testaceous. Head, pronotum and scutellum with blackish suffusion; base of gula piceous. Segment 2 of rostrum with a black spot submedially; segment 3 strongly suffused with piceous. Pleura, meso- and metasternum strongly suffused with piceous. Segments 2 and 3 of abdomen ventrally almost entirely piceous; segments 4–6 with a triangular spot mid-ventrally; apical margin and suffusion sub-laterally piceous; segment 7 with a median spot basally piceous and remainder almost entirely piceous. Apical segment of tarsi black in apical half; anterior and median tibiae with a median and apical black annulation; posterior tibiae apically and remainder with suffusion, black. Corium with very fine black maculation; veins whitish; membrane with black suffusion and spots; metathoracic wings faintly infumate. In the male the dark areas of the corium are more intense, also the spots on the membrane.

Structure. Principal tubercles on basal rostral segment rounded, truncate. Anterior lobe of pronotum sparsely tuberculate, the tubercles grouped more or less in rows; sub-dorsal carinae on posterior lobe very distinct, tuberculate. Projections on posterior margin of posterior pronotal lobe short, narrowly rounded. Carinae enclosing flattened area of abdomen ventrally feeble on segment 3, obsolescent on other segments.

	♂	♀
Total length	19·00 mm.	20·50 mm.
Hemelytra	12·00 mm.	12·00 mm.
Greatest pronotal length	7·00 mm.	7·00 mm.

SPECIMENS EXAMINED. One ♀ (holotype), Formosa, Arikan, 1909, Matsumura; 1 ♂, Kuraru, (Takao-shû), viii.1932, T. Tsida; 1 ♂, 2 ♀♀, Hoozan; 3 ♂♂, 2 ♀♀, Kosempo; 1 ♂, 1 ♀, Fuhosho; 1 ♀ Polisha; 1 ♂, Sokutsu, H. Sauter, 1909–1911.

Holotype in Hokkaido University, Sapporo, Japan.

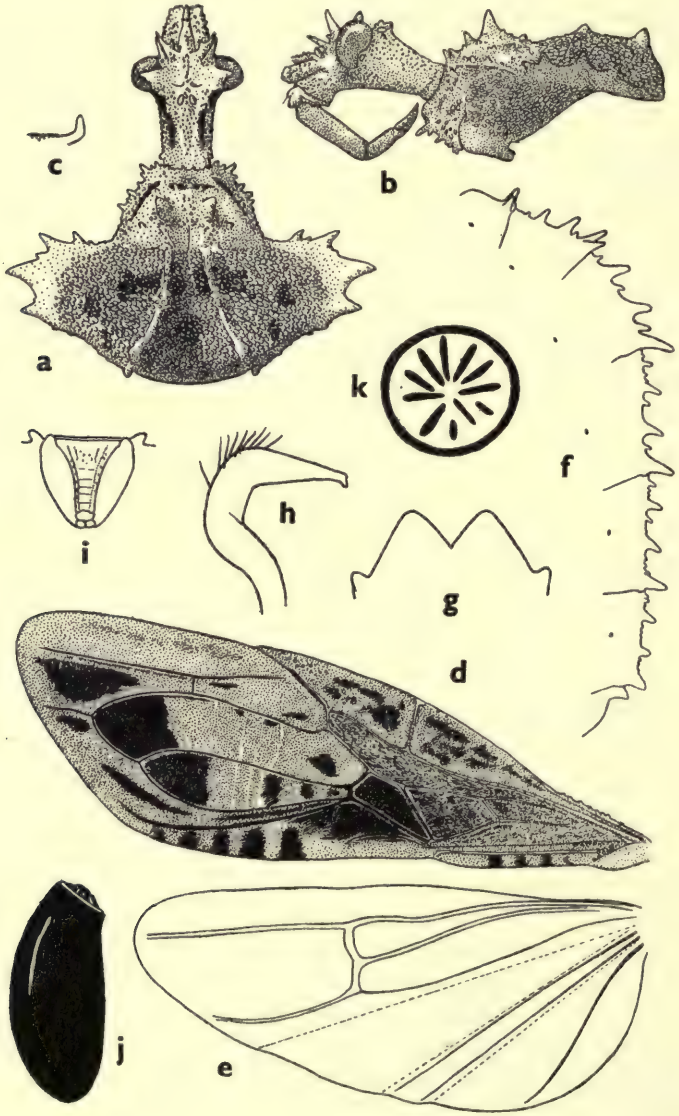

FIG. 16. *Neocentrocnemis formosana* (Matsumura). A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercle (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

Ovum (Text-fig. 16, j). Cylindrical, curved somewhat at opercular end. Chorion glabrous, obscurely reticulate. Chorion and operculum piceous; differentiated portion of chorion whitish. 2·50 mm.

Neocentrocnemis fuscipennis sp. n.

(Text-fig. 17)

Colour. Testaceous. Head with a transverse spot between eyes, two narrow longitudinal stripes laterally black. Segment 2 of rostrum with black suffusion; segments 3 and 4 with piceous suffusion. Pronotum with irregular confluent spots, pleura with suffusion, piceous; meso- and metasternum piceous with median carina testaceous. Connexivum with black suffusion; abdomen ventrally with large black areas. Corium brown; venation fuscous with whitish spots; membrane pale testaceous with fuscous suffusion and spots; metathoracic wings infumate with the median costal area hyaline; veins Sc and R pale yellow. Anterior and median tibiae with a suffused median annulation and apex black; posterior tibiae, except basally, suffused with piceous; coxae pale testaceous strongly suffused with piceous; trochanters pale testaceous; denticulate area on anterior coxae piceous; anterior femora with suffusion on outer surface, median femora with suffusion on upper surface, posterior femora, except base, and apex, black.

Structure. Basal antennal segment moderately strongly curved, spinose and with a long narrow spine on upper surface apically. Principal tubercles on basal rostral segment broadly rounded. Projections on posterior margin of posterior pronotal lobe short, conical. Connexival segments dorsally somewhat obscurely granulose; apical margin of segments without tubercles. Carinae enclosing flattened area of abdomen ventrally distinct, granulose. Principal veins of corium with obsolescent tubercles.

	♂	♀
Total length	20·50 mm.	20·00 mm.
Hemelytra	13·50 mm.	14·00 mm.
Greatest pronotal width .	8·50 mm.	10·00 mm.

Specimens examined. One ♂ (holotype), Indo-China, Luang Prabang, 6.xii.1917 1 ♀ (paratype), Laos, X. Khsuang, 14.iv.1919, R. V. de Salvaza.

Holotype in British Museum (Nat. Hist.) London; paratype in Rijksmuseum, van Natuurlijke Historie, Leiden, The Netherlands.

Ovum (Text-fig. 17, j). Cylindrical. Chorion and operculum piceous and glabrous; differentiated portion of chorion whitish. 2·60 mm.

Neocentrocnemis elliptica sp. n.

(Text-fig. 18)

Colour. Dark testaceous. Segment 2 of antennae with apex very pale testaceous and a sub-apical piceous annulation. Segments 2 and 3 of rostrum with a large piceous spot; segment 4 piceous. Tubercles on head, body and legs pale testaceous.

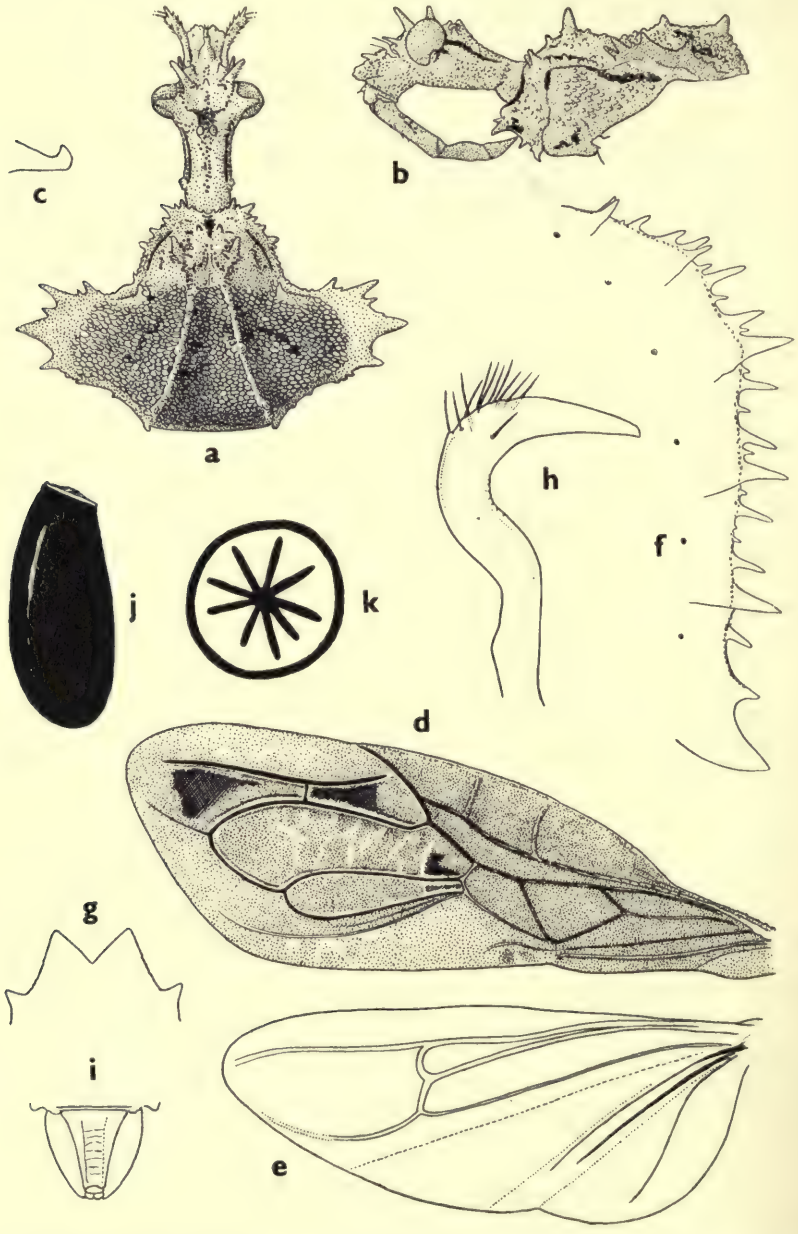

FIG. 17. *Neocentrocnemis fuscipennis* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

Posterior lobe of pronotum with sparse, shining black tubercles. Pleura suffused with piceous; meso- and metasternum piceous. Corium with confluent fuscous spots; membrane very pale testaceous with strong, confluent spots and suffusion; metathoracic wings infumate. Connexivum very pale testaceous or yellowish with darker testaceous external margin and with piceous suffusion; abdomen mid-ventrally with triangular spots on segments 3–6 and remainder with suffusion,

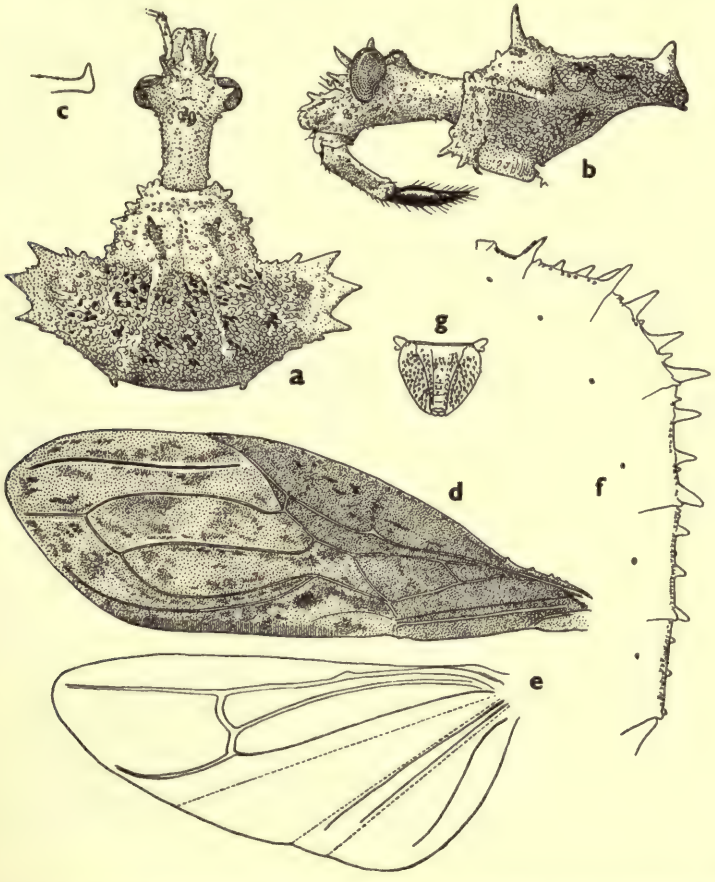

FIG. 18. *Neocentrocnemis elliptica* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♀.

piceous. Tarsi with segment 1 and apical half of segment 3 piceous; anterior tibiae with apex and a median annulation and faint suffusion on outer surface basally, black; median tibiae with apex, an interrupted median annulation and suffusion on outer surface basally black; posterior tibiae black apically and with dark brown suffusion; anterior femora with piceous suffusion on lower apical and inner and outer

surfaces ; median and posterior femora strongly suffused with black ; coxae suffused with piceous.

Structure. Principal tubercles on basal rostral segment conical, narrowly rounded apically. Projections on posterior margin of posterior pronotal lobe obsolescent. Connexival segments dorsally with abundant somewhat prominent granules ; apical margin of segments with a few tubercles, some of which cylindrical and directed outwards. Carinae enclosing flattened area of abdomen ventrally moderately prominent and granulose. Tubercles on corium mostly conical.

	♀
Total length	24·00 mm.
Hemelytra	14·50 mm.
Greatest pronotal width	9·00 mm.

Specimen examined. One ♀ (holotype), Peninsular Siam, Banchong, Trang, 21.iv.1924, I. H. N. Evans.

Holotype in British Museum (Nat. Hist) London.

Neocentrocnemis macgillavryi sp. n.

(Text-fig. 19)

Colour. Testaceous. Basal segment of antennae with black suffusion on upper surface. Segment 2 of rostrum with an obscure piceous spot basally ; segments 3 and 4 piceous ; segment 3 light brown apically. Posterior lobe of pronotum with small black areas. Propleura with piceous spots and suffusion ; meso- and metapleura shining piceous with tubercles and part of acetabula pale testaceous. Corium pale and greyish testaceous with fuscous suffusion ; membrane very pale testaceous with strong fuscous suffusion and spots ; cells almost entirely fuscous ; metathoracic wings infumate. Abdomen dorsally with large irregular piceous spots ; ventrally almost entirely piceous. Tarsi piceous with base of segment 3 and apex of segment 2 testaceous ; anterior tibiae with apex and a somewhat indistinct median annulation, black ; median tibiae with apex and a median annulation black ; posterior tibiae apically dark brown ; anterior femora with strong piceous suffusion basally and a piceous spot on lower lateral surface, sub-apically and two narrow, longitudinal stripes on upper surface, piceous ; median femora with base and longitudinal stripes piceous ; posterior femora piceous in basal half and with longitudinal stripes on upper surface apically ; coxae piceous.

Structure. Principal tubercles on basal rostral segment quadrate with the angles rounded. Postocular with prominent tubercles between and near outer margin of ocelli. Lateral spines on postocular prominent, acute. Projections on posterior margin of posterior pronotal lobe triangular with apex rounded. Connexival segments dorsally obscurely granulose ; apical margin of segments with moderately large tubercles of varied sizes. Carinae enclosing flattened area of abdomen ventrally obsolescent.

	♀
Total length	25·00 mm.
Hemelytra	16·00 mm.
Greatest pronotal width	11·00 mm.

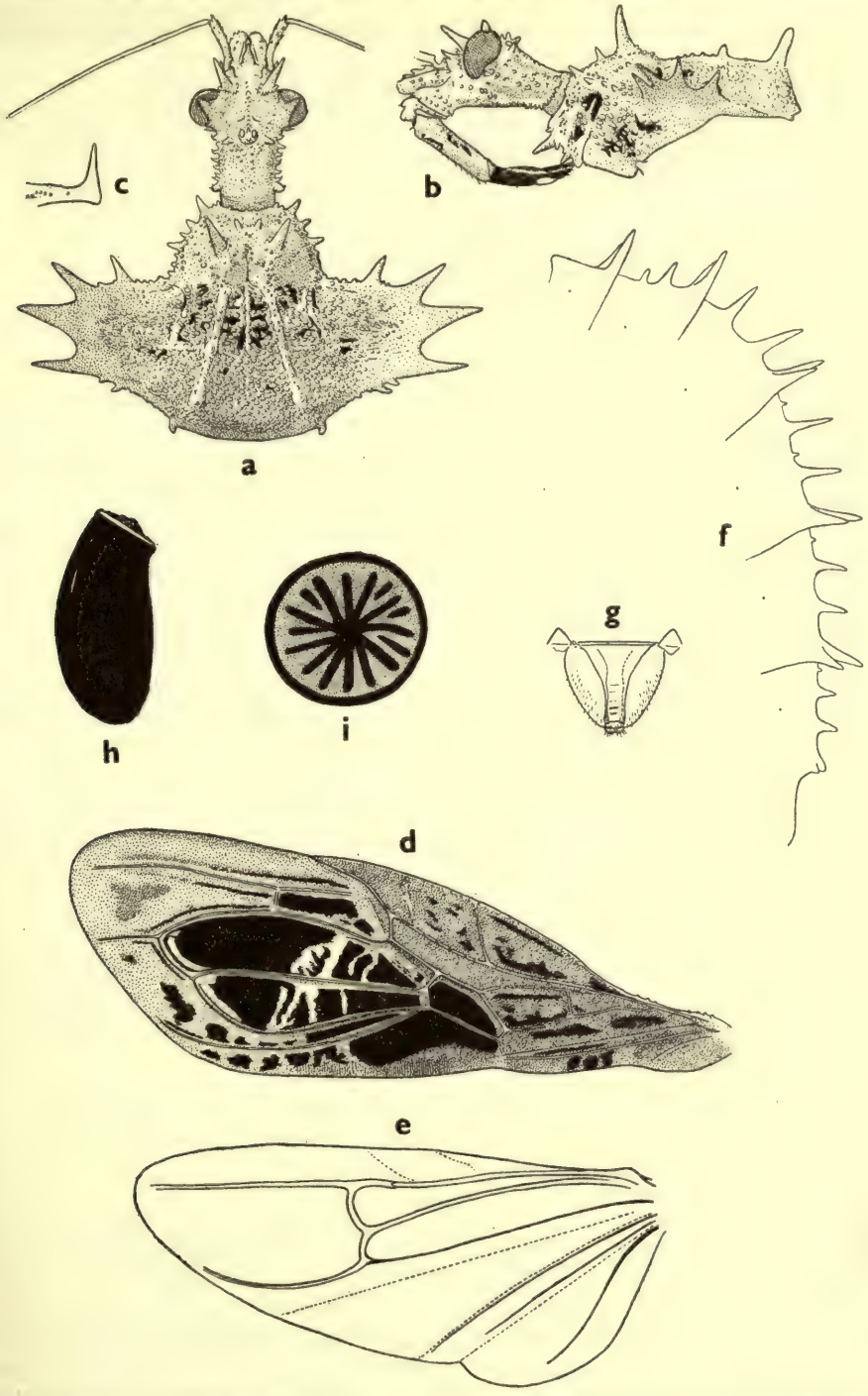

FIG. 19. *Neocentrocnemis macgillavryi* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercle (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♀; H. ovum; I. operculum.

SPECIMEN EXAMINED. One ♀ (holotype), Philippine Is., Siargao (coll. D. Macgillavry).

Holotype in Zoologisch Museum, Amsterdam, The Netherlands.

OVUM (Text-fig. 19, H). Sub-ampulliform ; chorion obscurely granulose ; chorion and operculum piceous ; differentiated portion of chorion whitish. 2·70 mm.

Neocentrocnemis philippinensis (Distant)

(Text-fig. 20)

1902, *Ann. Mag. nat. Hist.* (10), 181.

COLOUR. Testaceous. Segments 3 and 4 of antennae brownish. Head with a narrow stripe from ocelli almost to base, a sub-lateral basal spot, a broad lateral stripe from eye almost to base, gula, black. Segments 1 and 2 of rostrum testaceous ; segment 2 with piceous suffusion ; segments 3 and 4 piceous ; segment 3 testaceous apically. Posterior lobe of pronotum with black suffusion ; pleura almost entirely black ; meso- and metasternum black. Abdomen ventrally dark piceous, except greater part apically of segment 7 ; spots sub-dorsally and crescentic spots laterally very pale testaceous ; connexivum dorsally with black suffusion, a crescentic spot on segments 3–6 and a sub-circular spot on segment 7, pale testaceous. Corium blackish ; venation pale testaceous or whitish ; membrane pale testaceous with piceous spots and suffusion ; metathoracic wings pale infumate with veins Sc and R pale testaceous. Tarsi piceous with base of segment 3 and apex of segment 2 pale testaceous ; tibiae with apex and a suffused median annulation, black ; femora with strong and almost linear black suffusion ; coxae piceous ; tubercles on coxae pale testaceous ; anterior trochanters pale testaceous. with denticulate area piceous ; median and posterior trochanters pale testaceous.

STRUCTURE. Principal tubercles on basal rostral segment sub-cordate. Carinae enclosing flattened area of abdomen ventrally moderately well-defined. Projections on posterior margin of posterior pronotal lobe hardly at all prominent, rounded. Connexival segments dorsally obscurely granulose ; apical margin of segments with very few tubercles.

	♂	♀
Total length	23·50 mm.	27·00 mm.
Hemelytra	15·50 mm.	16·00 mm.
Greatest pronotal width . .	11·00 mm.	11·50 mm.

SPECIMENS EXAMINED. One ♂ (holotype), Philippine Is. Samar, (B.M., 96–277) ; 1 ♀, Cape Engano, Luzon (pres. by subscribers to Whitehead Exped). Both in British Museum (Nat. Hist.) London.

OVUM (Text-fig. 20, J). Cylindrical with one side moderately strongly curved and the other side straight. Chorion punctate near opercular end and remainder obscurely reticulate ; chorion and operculum piceous ; differentiated portion of chorion whitish. 3 mm.

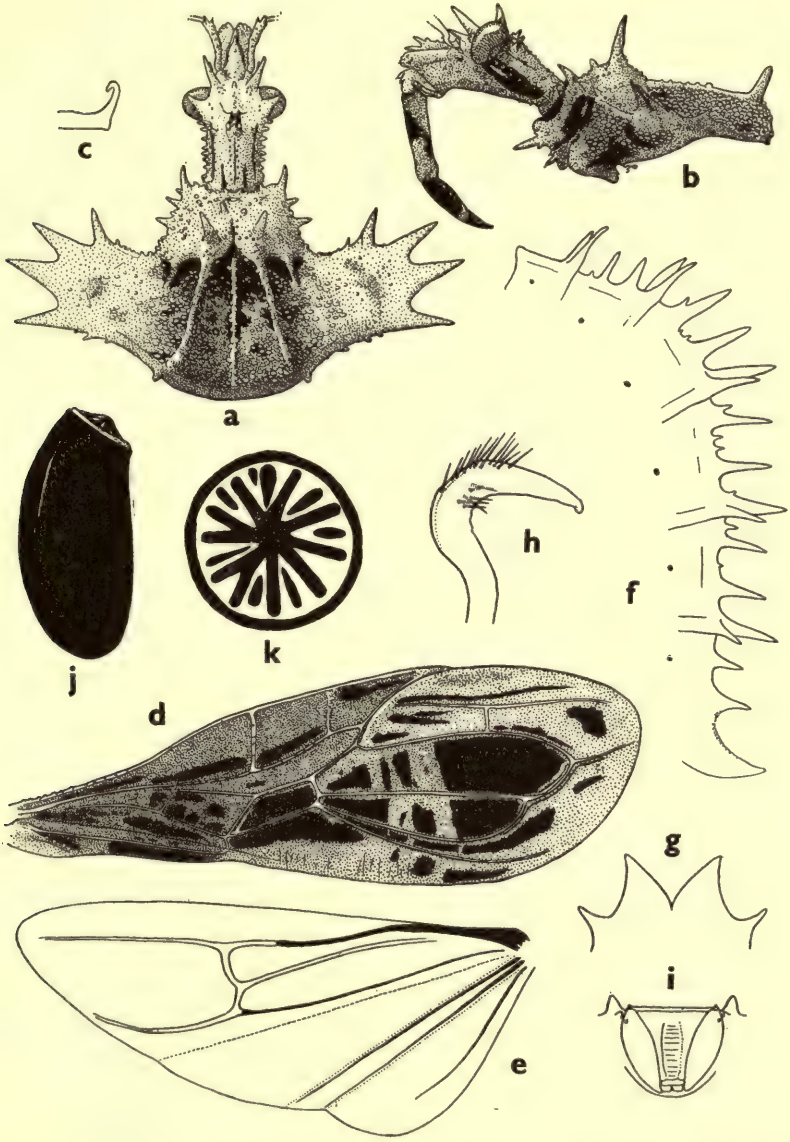

FIG. 20. *Neocentrocnemis philippinensis* (Distant) gen. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine, (lateral view) (probably deformed); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

Neocentrocnemis roepkei (Miller)

(Text-fig. 21)

1955, *Tijdschr. Ent.* 98, 61.

Colour. Testaceous. Vertex, both lobes of pronotum, pleura, abdomen ventrally with suffused black spots; connexivum and abdomen dorsally with confluent black spots; each segment of connexivum basally with a diagonal very pale testaceous or yellowish spot. Basal segment of rostrum, segment 2 with an irregular annulation interrupted on inner surface, black; segment 3 and 4 piceous, the former with testaceous suffusion on inner surface. Corium with very fine blackish maculation and suffused black spots; most cross-veins and tubercles in costal area white; membrane greyish with suffused dark infumate spots; metathoracic wings faintly testaceous and with infumate suffusion; vein R yellowish. Sterna black, except prosternum laterally, testaceous. Anterior and median femora with black suffusion basally and apically; posterior fenora with a wide, irregular sub-basal and sub-apical annulation black; anterior and median tibiae with black basal, median and apical annulations, the basal annulation somewhat obscure; posterior tibiae with dark brown suffusion and with apex narrowly black; coxae pale testaceous with piceous suffusion; trochanters pale testaceous.

Structure. Juga with prominent, conical, setigerous tubercles. Tubercles on head laterally conical and setigerous; postocular with a sub-acute conical tubercle near external margin of ocelli. Principal tubercles on basal rostral segment quadrate with angles rounded. Projections on posterior margin of posterior pronotal lobe very feeble, rounded. Carina enclosing flattened area of abdomen ventrally well-defined, obscurely granulose.

	♂	♀
Total length	21·50 mm.	24·00 mm.
Hemelytra	14·00 mm.	15·00 mm.
Greatest pronotal width . .	7·50 mm.	9·00 mm.

Specimens examined. One ♂ (holotype), O. Java, Bangelan, W. Roepke; 1 ♀ (paratype), Soekaboemi, F. le Moult.

Holotype in Zoologisch Museum, Amsterdam, paratype in Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands.

Ovum (Text-fig. 21, j). Cylindrical somewhat curved apically. Chorion glabrous, very obscurely reticulate. Chorion and operculum piceous; differentiated portion of chorion whitish. 2·50 mm.

Neocentrocnemis palawanica sp. n.

(Text-fig. 22)

Colour. Testaceous. Segments 2–4 of antennae suffused with brown; segment 2 narrowly whitish apically. Segments 1 and 2 of rostrum testaceous; segment 2 strongly suffused with black; segments 3 and 4 piceous, the former narrowly testaceous apically. Postocular laterally with a longitudinal brownish stripe. Discal tubercles on anterior lobe of pronotum narrowly piceous apically; anterior lobe anter-

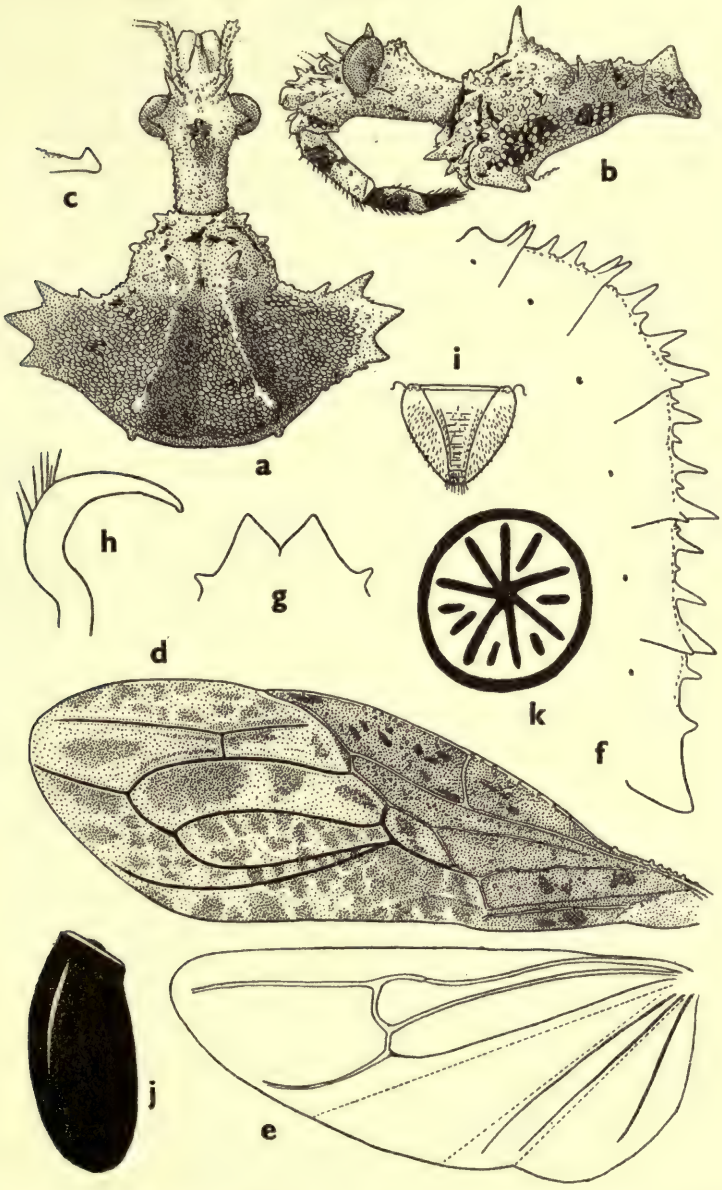

FIG. 21. *Neocentrocnemis roepkei* (Miller) gen. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

iorly with confluent spots, posterior lobe medially sub-dorsally and posteriorly, pleura with confluent spots and suffusion, black; meso- and metasternum black. Abdomen ventrally strongly suffused with black and with wide T-shaped black spots on midventral flattened area; connexivum with brownish suffusion. Corium greyish testaceous with fine black maculation; veins paler; membrane greyish testaceous with large and small spots in cells and marginally brown; metathoracic wings pale infumate; veins Sc and R testaceous. Tarsi black with segments 2 and 3 partly testaceous; tibiae with apex and a median annulation black, the annulation on posterior tibiae very wide; femora, except base and apex narrowly, strongly suffused with piceous.

STRUCTURE. Principal tubercles on basal rostral segment quadrate with angles rounded. Carinae enclosing flattened area of abdomen ventrally moderately well-defined and granulose. Connexival segments dorsally obscurely granulose; apical margin of segments 3–5 with many very short tubercles. Projections on posterior margin of posterior pronotal lobe very short, rounded. Postocular very obscurely tuberculate.

	♂	♀
Total length	23·00 mm.	25·00 mm.
Hemelytra	14·50 mm.	16·00 mm.
Greatest pronotal width . .	9·00 mm.	9·50 mm.

SPECIMENS EXAMINED. One ♂ (holotype); 3 ♂♂, 1 ♀ (paratypes), Philippine Is., Binaluan, N. Palawan, Nov.–Dec., 1913, leg. G. Boettcher (Taüber coll., B.M., 1949–474).

Holotype; 2 ♂♂, 1 ♀ (paratypes) in British Museum (Nat. Hist.), London; 1 ♂ (paratype) in Deutsches Entomologisches Institut, Berlin.

OVUM (Text-fig. 22, J). Cylindrical, somewhat curved at opercular end. Chorion glabrous. Chorion and operculum piceous; differentiated portion of chorion whitish. 2·50 mm.

2nd instar neanide (Text-fig. 3, A)

COLOUR. Testaceous with strong fuscous suffusion on vertex; nota, abdomen dorsally and ventrally, pleura and sterna piceous. Tarsi pale testaceous with apex of apical segment brownish; anterior and median tibiae with apex and a median annulation piceous; posterior tibiae with faint blackish suffusion; anterior femora with blackish areas on inner and outer basal and apical surfaces; median and posterior femora suffused with black; coxae and trochanters pale testaceous, the former with piceous suffusion.

STRUCTURE. Most of long spines with short lateral setigerous spines and tubercles. External margin of connexival segments with very short, slender spines between long spines. Abdomen sub-dorsally with erect, cylindrical tubercles near ostioles of dorsal glands, those on segments 3 the longest and most widely separated. Striae in stridulatory furrow well-developed. Ostioles of pro- and mesopleural spiracles elongate. Total length 7 mm.

SPECIMEN EXAMINED. One 2nd instar neanide, Philippine Is. Binaluan, N. Palawan, Nov.–Dec., 1913, leg. G. Boettcher (Taüber coll., B.M., 1949–474).

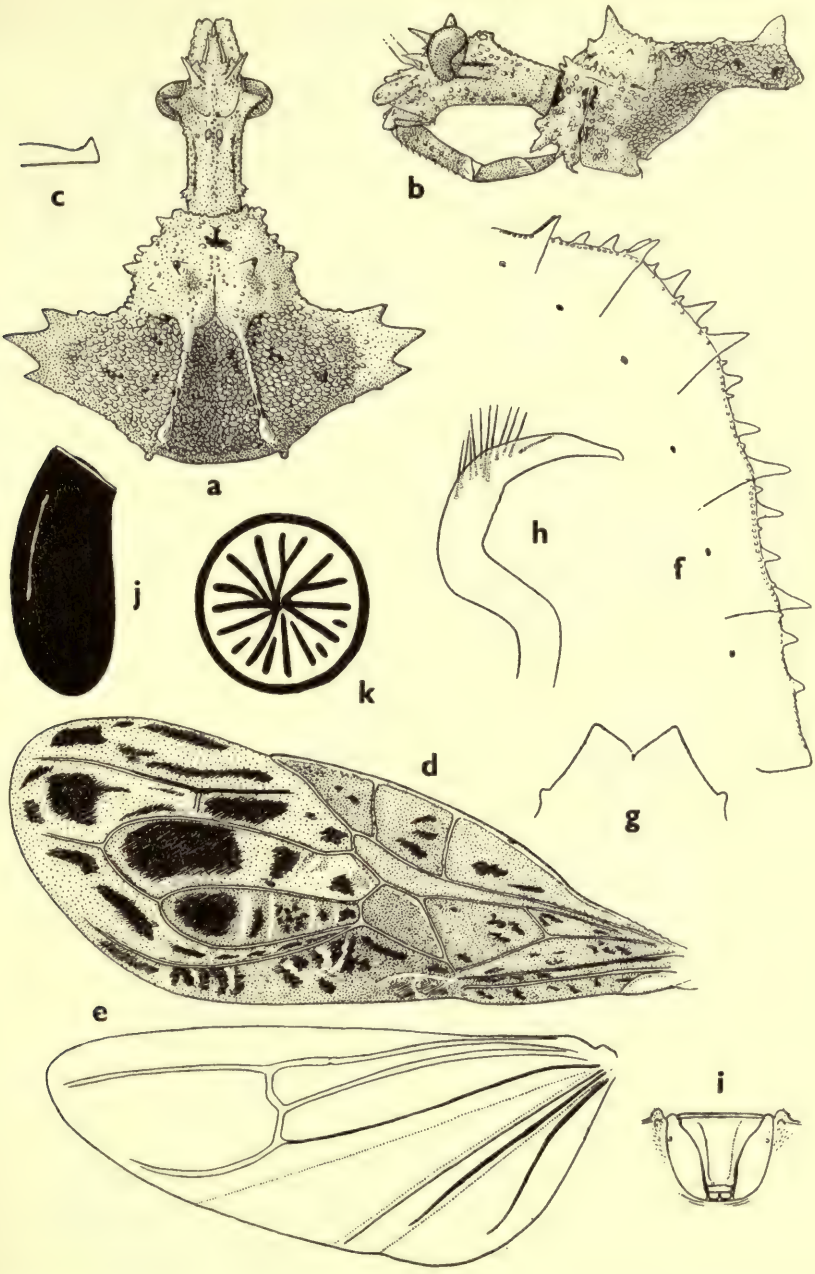

FIG. 22. *Neocentrocnemis palawanica* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

3rd instar neanide (Text-fig. 3, B)

Similar in coloration to 2nd instar, but differs in the more intense black and fuscous spots.

STRUCTURE. The chief differences from the 2nd instar are the shape of the spines, which are more robust and lack lateral setigerous tubercles and spines, and the much wider lateral expanded portion of the mesonotum. Total length 12 mm.

SPECIMEN EXAMINED. One 3rd instar neanide (same data as for 2nd instar).

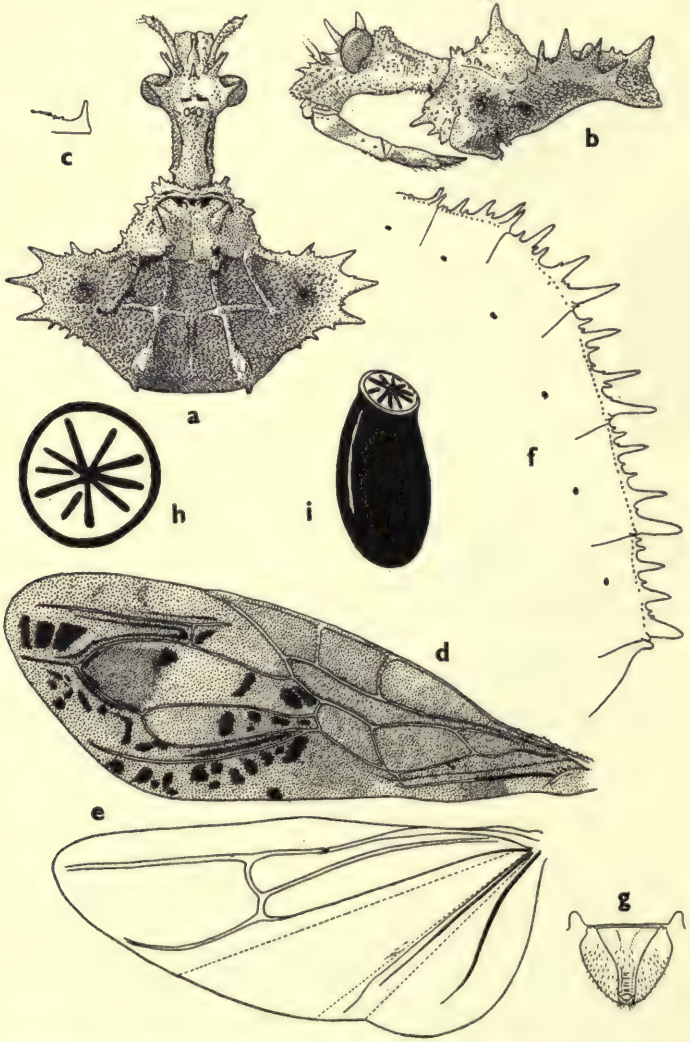

FIG. 23. *Neocentrocnemis celebensis* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head; pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♀; H. operculum; I. ovum.

Neocentrocnemis celebensis sp. n.

(Text-fig. 23)

Colour. Testaceous. Segments 2 and 3 of rostrum with piceous suffusion. Head with a narrow black stripe on postocular laterally. Pronotum, pleura, meso- and metasternum suffused with piceous. Scutellum brown ; apical spine pale testaceous. Connexivum dorsally with a narrow fuscous stripe on each segment basally ; abdomen ventrally with strong brown and piceous suffusion. Corium blackish with very fine brown maculation ; venation brownish ; membrane testaceous with fuscous spots ; metathoracic wings pale infumate. Tarsi basally and apically piceous ; anterior tibiae with a narrow median and apical annulation, median tibiae with a narrow apical and very wide median annulation brown ; femora strongly suffused with piceous ; trochanters testaceous ; coxae testaceous with suffused piceous spots.

Structure. Principal tubercles on basal rostral segment quadrate with the angles rounded. Lateral expansions of posterior pronotal lobe hardly at all tuberculate. Connexival segments very feebly and obscurely granulose ; apical margin of segments with some low, rounded tubercles. Projections on posterior margin of posterior pronotal lobe obsolescent. Carinae enclosing flattened area of abdomen ventrally obsolescent, feebly granulose. Abdomen in outline strongly elliptical.

	♀.
Total length	23·00 mm.
Hemelytra	15·00 mm.
Greatest pronotal width	9·00 mm.

Specimen examined. One ♀ (holotype), Celebes (Coll. Breddin).

Holotype in Deutsches Entomologisches Institut, Berlin, Germany.

Ovum (Text-fig. 23, j). Cylindrical somewhat curved at opercular end. Chorion smooth, minutely reticulate. Chorion and carinae on operculum piceous ; differentiated portion of chorion whitish. 2·50 mm.

Neocentrocnemis ståli (Reuter)

(Text-fig. 24)

1881, ad *Cognit, Reduv. Mundi Antiqui*, 65 ; *Acta Soc. Sci. fenn.*, 12.

Colour. Pale testaceous. Segment 2 of antennae whitish apically and with a piceous narrow, sub-apical annulation. Head with a transverse stripe between eyes and a narrow stripe from eyes laterally almost to base ; gula basally piceous. Rostrum with faint suffusion on segment 1 and strong suffusion on remaining segments, blackish. Anterior lobe of pronotum with suffusion anteriorly and laterally ; posterior lobe anteriorly blackish. Pleura, meso- and metasternum almost entirely piceous. Scutellum brown ; apical spine paler. Corium greyish with veins white except basal half of R and base of costa, brownish ; clavus with fuscous suffusion apically ; membrane whitish with strong fuscous suffusion basally and fuscous spots on external margin, in cells and apically ; metathoracic wings hyaline, faintly infumate. Con-

nexivum dorsally brownish with black suffusion and confluent spots. Abdomen ventrally with all segments strongly suffused with piceous. Coxae piceous with testaceous suffusion ; trochanters testaceous ; femora with strong piceous suffusion ;

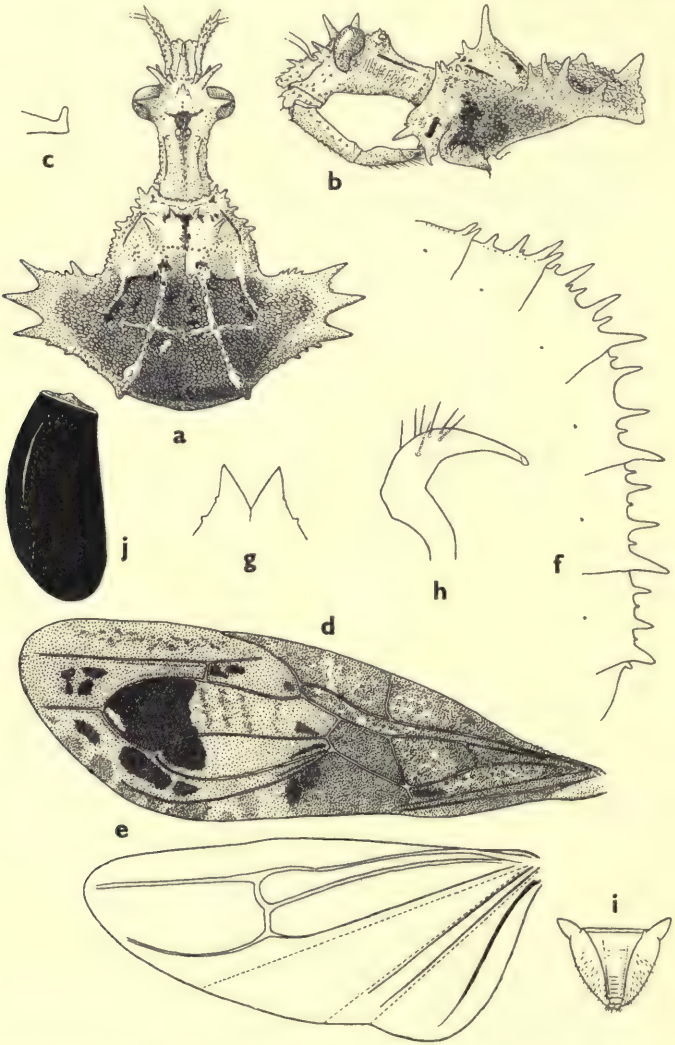

FIG. 24. *Neocentrocnemis stâli* (Reuter) gen. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum.

anterior and median tibiae with an apical and median black annulation ; posterior tibiae with a wide brownish suffusion medially and apically.

STRUCTURE. Head sparsely tuberculate, the tubercles on lower margin conical, acute. Carinae enclosing flattened area of abdomen ventrally very feeble. Principal

tubercles on basal rostral segment conical, broadly rounded. Connexival segments dorsally very obscurely granulose. Projections on posterior margin of posterior pronotal lobe very feeble, rounded.

	♂	♀
Total length	20·00 mm.	22·00 mm.
Hemelytra	13·00 mm.	13·00 mm.
Greatest pronotal width . .	7·50 mm.	8·00 mm.

SPECIMENS EXAMINED. One ♂, India, Chandkira, Sylhet, (B.M., 1926–171) ; 1♂, Sikkim, (B.M., 1911–383) ; 1 ♀, Burma, N. Khasia, 1,500–3,000 ft., Chennel, (B.M., 1911–383) ; 1 ♀, Assam, W. F. Badgley, (B.M., 1906–185) ; 1 ♀ (holotype), India, Darjeeling. Staudinger.

Holotype in Naturhistoriska Riksmuseum, Stockholm, Sweden.

OVUM (Text-fig. 24, J). Cylindrical, curved on one side, almost straight on the other. Chorion smooth, minutely reticulate. Chorion and ridges on operculum piceous ; differentiated portion of chorion whitish. 2·50 mm.

Neocentrocnemis semiarmata sp. n.

(Text-fig. 25)

COLOUR. Testaceous. Segments 1 and 2 of antennae pale testaceous ; segment 2 with faint brownish annulation sub-apically. Segment 2 of rostrum pale testaceous with brown suffusion on outer surface ; segments 3 and 4 piceous. Propleura anteriorly, meso- and metapleura with strong piceous suffusion. Subdorsal tubercles on anterior pronotal lobe narrowly brown apically. Disc of scutellum piceous. Connexivum dorsally pale testaceous with brown and fuscous suffusion ; abdomen dorsally with transverse piceous stripes ; ventrally piceous, except basal part of carinae enclosing flattened area of segments 3–6, and connexivum testaceous. Corium pale testaceous with fuscous suffused spots on clavus and fuscous suffusion elsewhere ; membrane pale testaceous with suffusion and large spots fuscous ; metathoracic wings infumate. Basal segment of tarsi piceous ; segment 2 pale testaceous, narrowly piceous basally ; segment 3 piceous, broadly testaceous basally ; anterior and median tibiae black apically ; posterior tibiae testaceous, narrowly black apically and with a faint median brownish suffusion ; femora testaceous with strong black suffusion in basal half ; trochanters testaceous ; coxae piceous with tubercles testaceous.

STRUCTURE. Principal tubercles on basal rostral segment conical, rounded apically ; internal tubercle very short, conical, acute ; segment 2 of rostrum a little longer than segments 3 and 4 together. Connexival segments dorsally obscurely granulose ; apical margin of segments with a few low, rounded tubercles. Projections on posterior margin of posterior pronotal lobe short, narrowly rounded apically. Pleura very sparsely tuberculate. Carinae enclosing flattened area of abdomen ventrally distinct, obscurely granulose. Anterior femora with comparatively few spines, mostly very short and acutely conical ; median femora with moderately long,

slender, acute spines on lower surface ; posterior femora with a few acute spines on lower surface apically and a moderately long acute spine on apical margin.

	♂	♀
Total length	21·00 mm.	22·00 mm.
Hemelytra	12·50 mm.	13·00 mm.
Greatest pronotal width . .	9·00 mm.	9·00 mm.

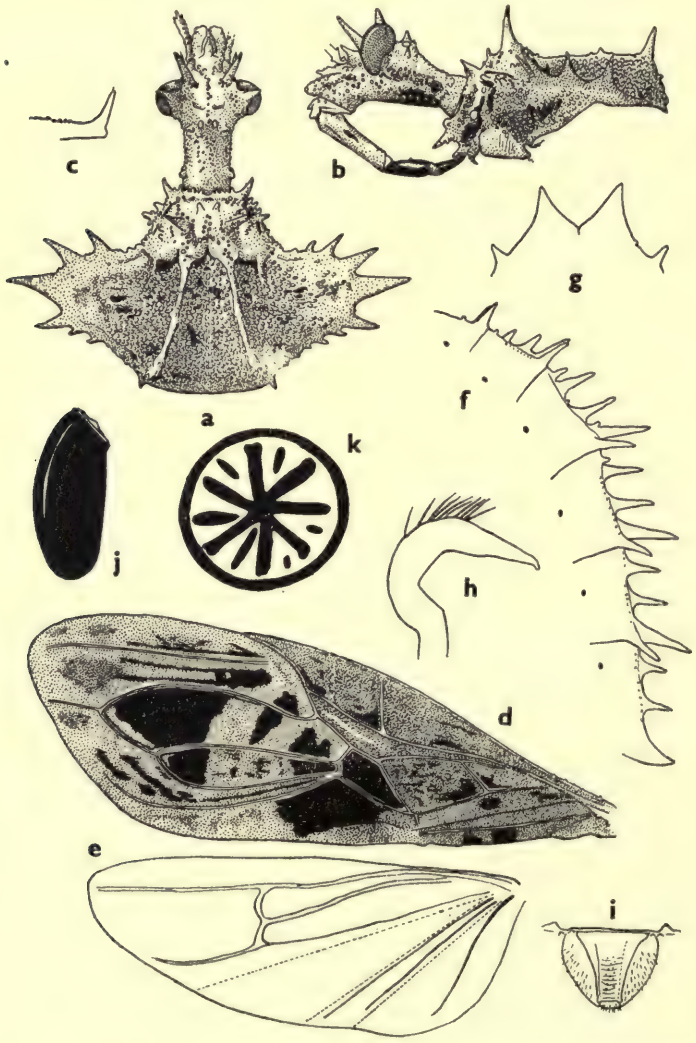

FIG. 25. *Neocentrocnemis semiarmata* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

Specimens examined. One ♂ (holotype), 1 ♀ (paratype), Philippine Is., Mt. Isarog, 4,000 ft., S. Luzon, leg. G. Boettcher (Taüber coll., B.M., 1949–474).

Holotype and paratype in British Museum (Nat. Hist.) London.

Ovum (Text-fig. 25, j). Cylindrical, curved on one side, straight on other; opercular end oblique. Chorion sub-glabrous. Chorion and carinae on operculum piceous; differentiated portion of chorion whitish. 3·50 mm.

Neocentrocnemis impavida sp. n.

(Text-fig. 26)

Colour. Testaceous. Antennae missing. Gula brown laterally; base of head, except dorsally, shining piceous. Postocular with an interrupted narrow black stripe laterally. Both lobes of pronotum, pleura with black areas and spots. Abdomen dorso-laterally and connexivum with black suffusion; ventrally strongly suffused with black. Corium pale testaceous with fuscous spots; membrane whitish testaceous with fuscous suffusion and spots; metathoracic wings faintly infumate. Tarsi testaceous; apical segment piceous apically; anterior and median tibiae with apex and a median annulation black; posterior tibiae with piceous suffusion apically and a very faint brown suffusion medially; anterior and median femora with strong piceous suffusion; posterior femora piceous, except apex; trochanters testaceous; anterior coxaetestaceous with piceous spot; median and posterior coxae almost entirely piceous.

Structure. Principal tubercles on basal rostral segment trapeziform with angles rounded; inner tubercles short, cylindrical. Projections on posterior margin of posterior pronotal lobe feeble, rounded. Connexival segments dorsally with abundant granules on segments 3–6; apical margin of segments 3 and 4 with a few rounded tubercles. Carinae enclosing flattened area of abdomen ventrally prominent, strongly granulose.

	♀
Total length	25·00 mm.
Hemelytra	14·00 mm.
Greatest pronotal width	10·00 mm.

Specimen examined. One ♀ (holotype), Philippine Is., Kolambugan, N. Mindanao, leg. G. Boettcher (Tauber coll., B.M., 1949–474).

Holotype in British Museum (Nat. Hist.), London.

Paracentrocnemis gen. nov.

Basal segment of antennae shorter than anteocular; segment 3 much longer than basal segment. Anteocular a little shorter than postocular. Segment 2 of rostrum thicker basally than apically. Connexival segments with very short tubercles on external margin. Anterior tibiae simple. Scutellum with a short erect spine apically. Posterior tibiae sub-equal in length to posterior femora. Metathoracic wings hyaline.

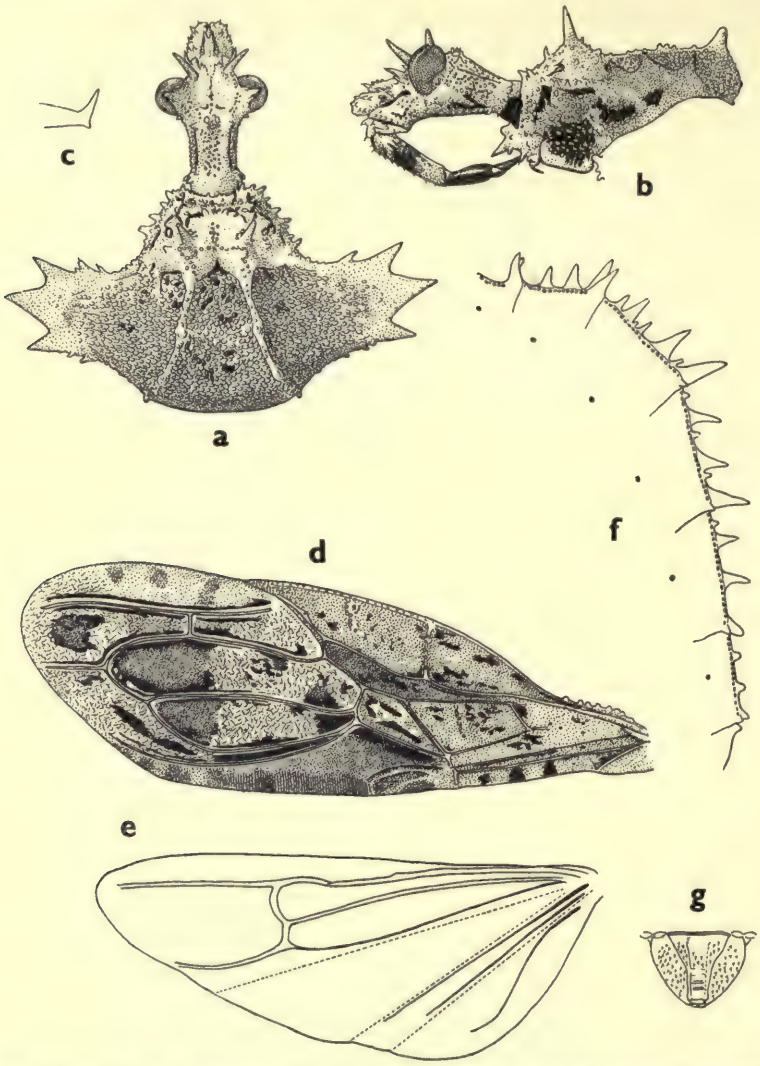

FIG. 26. *Neocentrocnemis impavida* gen. n. sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar (spine lateral) view), D. hemelytron, E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♀.

Type Species *Centrocnemis dearmata* Distant.

Key to *Paracentrocnemis* species

1. Lateral spines on collar black . . . . . 2.
–. Lateral spines on collar testaceous . . . . . 3.
2. Lateral spines on collar very short, conical, acute . . . . *dearmata* (Distant).
–. Lateral spines on collar moderately long, cylindrical, acute . . . *campbelli* sp. n.
3. Lateral expanded area of posterior pronotal lobe truncate with a broad median triangular projection . . . . . *rugipennis* sp. n.

Paracentrocnemis dearmata (Distant)

(Text-fig. 27)

1904, Fauna Brit. India, Rhyn. 2, 246.

Colour. Testaceous. Tubercles and spines paler; lateral spine on collar black. Apical scutellar spine whitish. Head laterally, segments 2 and 3 of rostrum, pleura, suffused with piceous. Corium suffused with black and with rugulose areas and confluent tubercles whitish; membrane with large fuscous spot in external cell and apically; metathoracic wings hyaline. Anterior and median tibiae with basal,

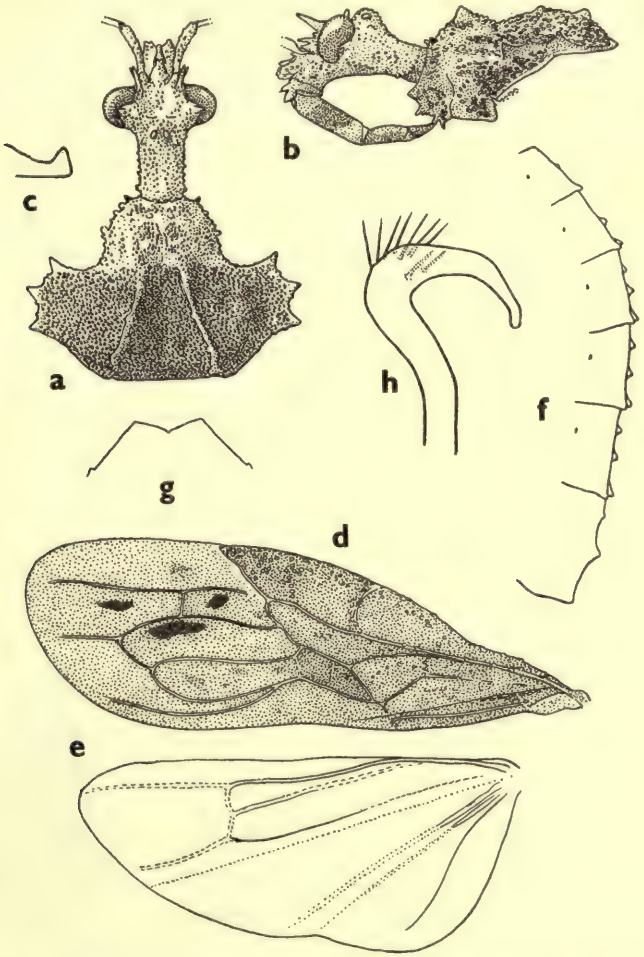

Fig. 27. *Paracentrocnemis dearmata* (Distant) gen. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago.

median and apical suffused piceous annulations; posterior tibiae piceous, except narrowly basally pale testaceous; apical half of 3rd. tarsal segment piceous.

STRUCTURE. Principal tubercles on basal rostral segment triangular. Spines on lateral expansions of posterior pronotal lobe very short, conical. Carinae enclosing flattened area of abdomen ventrally very distinct. Projections on posterior margin of posterior pronotal lobe obsolescent.

	♂
Total length	13·50 mm.
Hemelytra	9·00 mm.
Greatest pronotal width	4·50 mm.

SPECIMEN EXAMINED. One ♂ (holotype), Ceylon, Colombo, Lewis (Distant coll., B.M., 1911–383).

Holotype in British Museum (Nat. Hist.), London.

Paracentrocnemis rugipennis sp. n.

(Text-fig. 28)

COLOUR. Dark testaceous. Segments 2 and 3 of rostrum suffused with black; segment 4 piceous. Postocular laterally with two somewhat obscure, parallel black stripes. Pleura with piceous suffusion. Metasternum piceous. Apex of scutellar spine pale testaceous. Abdomen ventrally with confluent maculation and a wide black stripe along external margin of carinae enclosing flattened area. Corium pale testaceous with fine black maculation; membrane greyish testaceous with a suffused fuscous spot in external cell and apically; metathoracic wings hyaline very faintly infumate in sub-costal area apically; veins Sc and R pale testaceous with apical half of R. brown. Anterior tibiae narrowly black apically and with a somewhat irregular basal and median black annulation; tarsi piceous apically; posterior tibiae suffused with piceous; femora strongly suffused with black; coxae and trochanters suffused with piceous.

STRUCTURE. Principal tubercles on basal rostral segment conical, acute. Carinae enclosing flattened area of abdomen ventrally moderately distinct. Projections on posterior margin of posterior pronotal lobe absent. Dorsal surface of connexival segments coarsely but sparsely granulose; apical margin of segments with feeble, low, rounded tubercles.

	♂	♀
Total length	17·00 mm.	17·00 mm.
Hemelytra	12·00 mm.	11·50 mm.
Greatest pronotal width	6·00 mm.	6·00 mm.

SPECIMENS EXAMINED. One ♂ (holotype), 1 ♂, (paratype), Ceylon, Maskeliya; 1 ♀ (paratype), (no precise locality), Lewis, (Distant coll., B.M., 1911–383); 1 ♀ (paratype), Pundaloya.

Holotype and paratypes in British Museum (Nat. Hist.), London.

Ovum (Text-fig. 28, j). Cylindrical, somewhat curved at opercular end. Chorion glabrous, sparsely reticulate. Chorion and ridges on operculum piceous or dark brown ; operculum testaceous ; differentiated portion of chorion whitish. 2·50 mm.

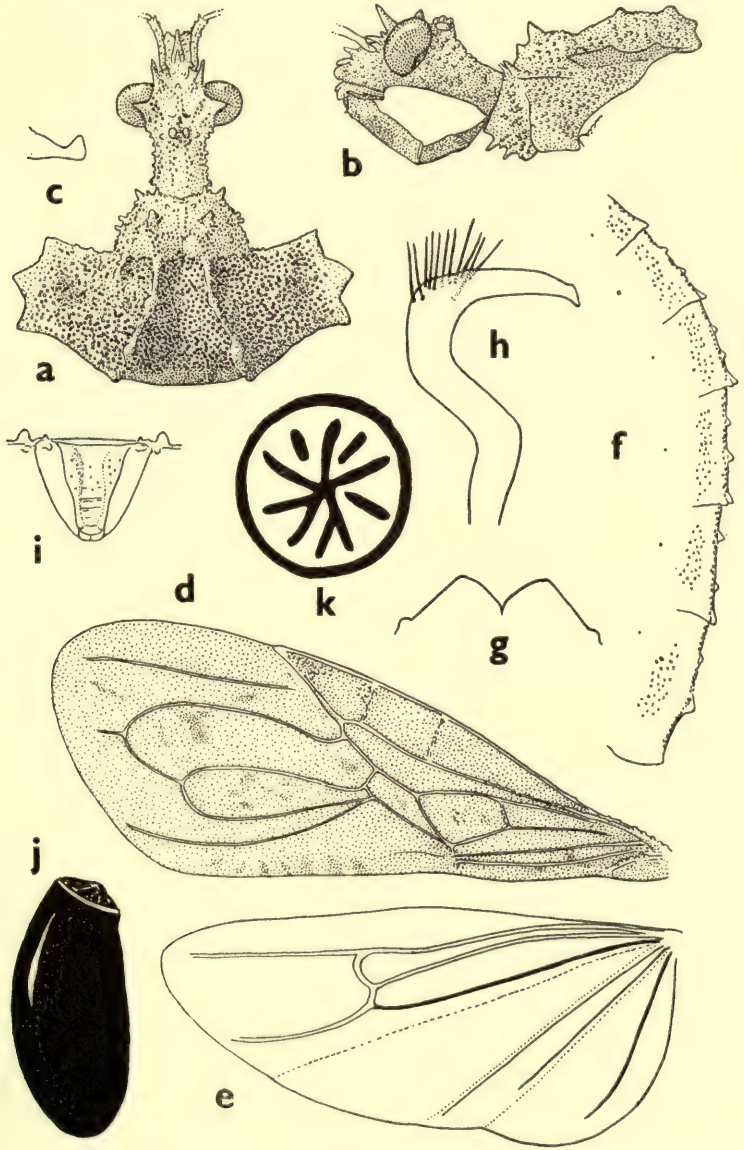

Fig. 28. *Paracentrocnemis rugipennis* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

3rd instar neanide (Text-fig. 3, D)

COLOUR. Testaceous with black suffusion on antennae, head, pronotum and segments 3–5 of abdomen dorsally. Longer spines on head and pronotum and on connexival segments almost entirely black. Tarsi testaceous; apical segment suffused with black; anterior and median tibiae apically and with a median annulation, brownish; posterior tibiae, except base, brown. Pleura and sterna piceous. Total length 4·50 mm.

SPECIMEN EXAMINED. One 3rd instar neanide, Ceylon (no precise locality).

Paracentrocnemis campbelli sp. n.

(Text-fig. 29)

COLOUR. Dark testaceous. Third and 4th segments of rostrum sufiused with piceous. Base of gula, lateral spines on collar piceous. Some tubercles on collar and on anterior pronotal lobe laterally reddish. Apical spine of scutellum very pale testaceous. Meso- and metapleura suffused with piceous. Corium suffused with black; membrane with black suffused spot in external cell and apically; metathoracic wings hyaline. Segments 4–6 of abdomen with a brown spot laterally on midventral flattened area; connexival segments with obscure pale testaceous spots. Anterior and median tibiae apically narrowly black and with a faint median brownish annulation; posterior tibiae narrowly apically and with a wide median annulation brownish.

STRUCTURE. Principal tubercles on basal rostral segment conical, acute. Connexival segments dorsally finely granulose; apical margin of segments with a very few, very feeble, low, rounded tubercles. Carinae enclosing flattened area of abdomen midventrally very distinct. Projections on posterior margin of posterior pronotal lobe feeble, rounded.

	♂	♀
Total length	15·50 mm.	15·50 mm.
Hemelytra	9·50 mm.	9·50 mm.
Greatest pronotal width . .	5·00 mm.	5·00 mm.

SPECIMENS EXAMINED. One ♂ (holotype); 1 ♂, 2 ♀♀ (paratypes), S. India (no precise locality); 1 ♂, Chikkaballapura (B.M., 171–1926).

Holotype and paratypes in British Museum (Nat. Hist.) London.

OVUM (Text-fig. 29, J). Cylindrical, much narrower and somewhat curved at opercular end. Chorion glabrous very feebly reticulate. Chorion and ridges on operculum piceous; operculum testaceous; differentiated portion of chorion whitish. 2·50 mm.

5th instar neanide (Text-fig. 3, C)

COLOUR. Testaceous. Antennae, head, anterior lobe of pronotum, segment 2 of rostrum suffused with black. Lateral spines on collar black. Apex of some marginal spines on rudimentary hemelytra brown. Meso- and metapleura and sterna piceous, the former with testaceous maculation. Abdomen dorsally and ventrally with strong

fuscous confluent maculation and suffusion. Ostioles of abdominal glands reddish. Tarsi pale testaceous with apical half of segments piceous; anterior and median tibiae with apex and a somewhat irregular median annulation fuscous; posterior tibiae with a wide, somewhat irregular fuscous suffusion in apical three-fourths; femora with fuscous suffusion; coxae and trochanters pale testaceous with fuscous suffusion. Total length 11 mm.

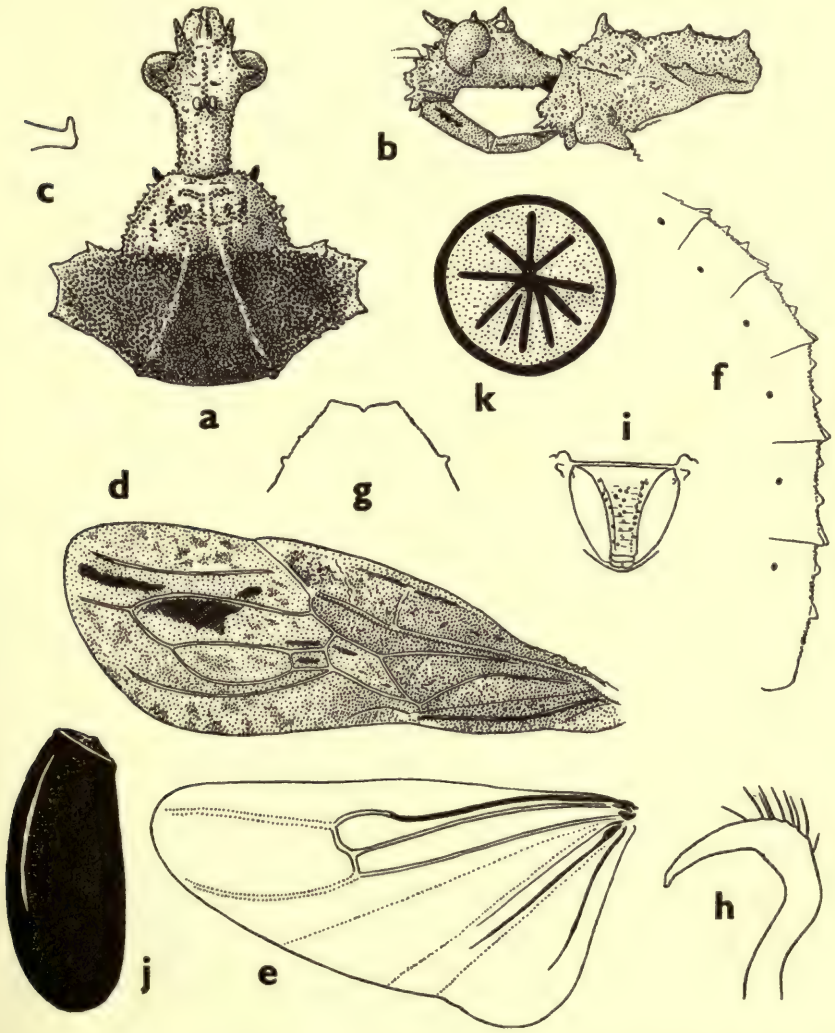

FIG. 29. *Paracentrocnemis campbelli* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

SPECIMEN EXAMINED. One 5th instar neanide, S. India, Chikkaballapura, T. V. Campbell. (B.M., 1926–171).

Centrocnemoides gen. nov.

Basal segment of antennae sub-equal in length to anteocular. Segment 2 of rostrum a little thicker basally than apically. Anteocular much shorter than postocular. Connexival segments with 2 spines at external apical angle of segments 2 and 3. Scutellum with an erect spine laterally compressed. Posterior tibiae longer than posterior femora. Metathoracic wings yellow.

Type species *Centrocnemis granulosa* Stål

Key to *Centrocnemoides* species

1. Postocular with two narrow, short, black stripes sub-basally laterally; lateral tubercles on anterior pronotal lobe distinctly white apically . . *granulosa* (Stål).
–. Postocular suffused with black; lateral tubercles on anterior pronotal lobe unicolorous 2.
2. Juga strongly tuberculate . . . . . 3.
–. Juga almost smooth . . . . . *sumatrana* sp. n.
3. Inner basal area of membrane and spots in cells fuscous . . . *drescheri* sp. n.
–. Inner basal area of membrane and spots in cells brown . . . . *horsfieldi* sp. n.

Centrocnemoides granulosa (Stål)

(Text-fig. 30)

1861, *Ofv. Vet. Ak. Förh.* 244.

COLOUR. Pale testaceous with most of the tubercles pale luteous apically. Segment 2 of rostrum with black suffusion medially; segments 3 and 4 piceous. Pronotum and pleura with black confluent spots. Disc of scutellum black; tubercles dark testaceous. Corium blackish with veins mostly white and with pale tubercles and confluent spots; membrane with strong brown and fuscous suffusion basally and with suffused fuscous spots in cells and on remainder; metathoracic wings dark yellow. Connexivum with confluent black spots and testaceous tubercles and granules; segments 2 and 3 of abdomen ventrally strongly suffused with piceous; remaining segments with faint blackish suffusion; Coxae brown or piceous with pale testaceous suffusion; trochanters testaceous; femora with brown suffusion; anterior and median tibiae with an apical and a somewhat obscure median and basal annulation blackish; tarsi suffused with brown apically.

STRUCTURE. Principal tubercles on basal rostral segment oblong with the angles rounded. Carinae enclosing flattened area of abdomen ventrally moderately distinct. Projections on posterior margin of posterior pronotal lobe feeble, rounded. Dorsal surface of connexivum coarsely granulose; apical margin of segments with moderately large, conical tubercles.

	♂	♀
Total length	14·50 mm.	16·50 mm.
Hemelytra	9·50 mm.	10·00 mm.
Greatest pronotal width . .	5·50 mm.	5·50 mm.

SPECIMENS EXAMINED. One ♂ (holotype), Malacca (probably Malaya is intended); 1 ♀, Malaya, Gunong Tahan, Pahang, 2,500–3,500 ft., May, July, 1906, H. C. Robinson (B.M., 1907–48).

Holotype in Naturhistoriska Riksmuseum, Stockholm, Sweden.

OVUM (Text-fig. 30, J). Cylindrical, narrower and somewhat curved at opercular end; chorion glabrous; chorion and opercular elevated area brown; operculum testaceous; differentiated portion of chorion whitish. 2·50 mm.

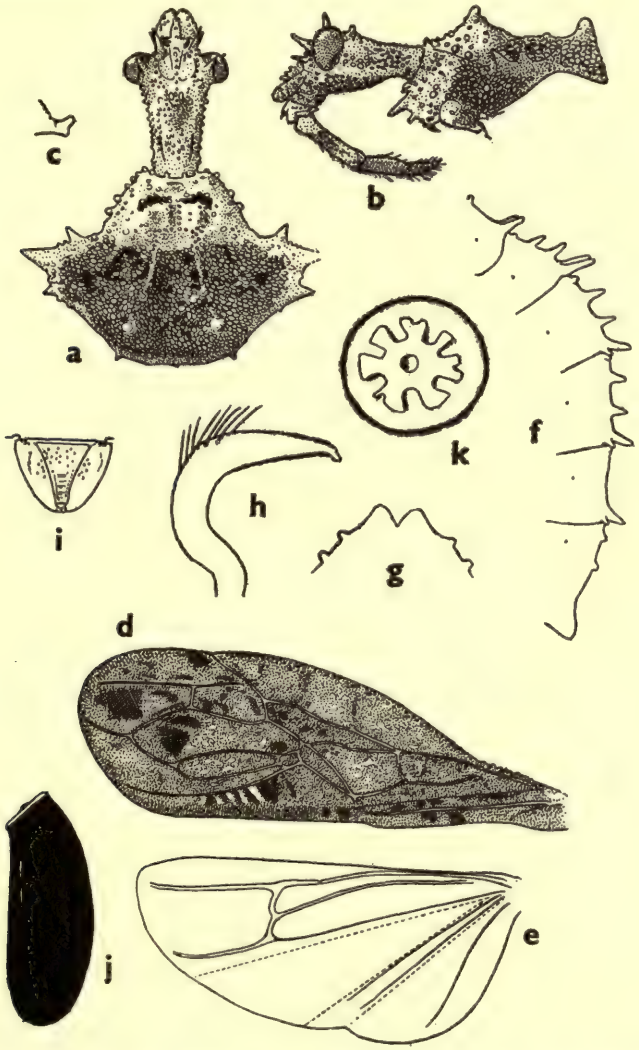

FIG. 30. *Centrocnemoides granulosa* (Stål) gen. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

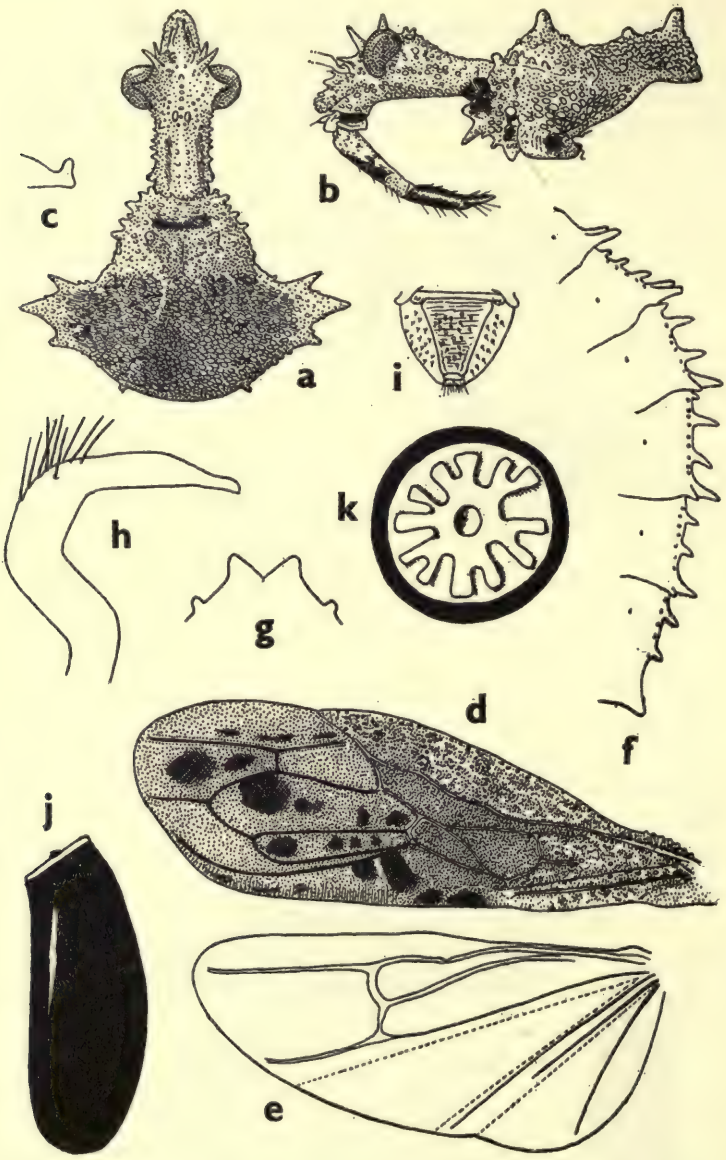

FIG. 31. *Centrocnemoides horsfieldi* gen. n., sp. n. A. Head and pronotum (dorsal view); B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♂; H. harpago; I. apex of abdomen, ♀; J. ovum; K. operculum.

Centrocnemoides horsfieldi sp. n.

(Text-fig. 31)

Colour. Testaceous. Basal segment of rostrum almost entirely piceous ; segment 2 pale testaceous with a median brownish suffusion ; segments 3 and 4 piceous. Head with gula, a stripe laterally and sub-dorsally on postocular, a suffusion on juga laterally, black ; vertex and tylus basally suffused with black. Anterior lobe of pronotum anteriorly, posterior lobe, except large tubercles and expanded lateral areas narrowly strongly suffused with black. Disc of scutellum black with tubercles brown ; lateral margins and apex dark testaceous. Pleura and sterna suffused with black. Corium black with veins, some tubercles and rugose areas pale testaceous ; membrane testaceous with strong fuscous suffusion in anal area and paler fuscous confluent spots and suffusion in remainder ; metathoracic wings yellow. Connexivum black with pale oblique testaceous spot basally in each segment ; tubercles mostly testaceous ; spines blackish or dark testaceous ; abdomen ventrally strongly suffused with black, particularly segment 3 Tarsi testaceous ; anterior and median tibiae with an apical median and basal annulation black ; posterior tibiae testaceous ; femora with piceous suffusion.

Structure. Principal tubercles on basal rostral segment quadrate with the angles rounded. Costal margin of corium entirely tuberculate, the basal tubercles moderately large. Carinae enclosing flattened area of abdomen ventrally somewhat wide, feebly rounded. Projections on posterior margin of posterior pronotal lobe narrowly rounded apically, feebly concave on inner surface. Connexival segments dorsally coarsely granulose ; apical margin of segments with a few sub-conical tubercles.

	♂	♀
Total length	14·50 mm.	17·00 mm.
Hemelytra	9·40 mm.	10·00 mm.
Greatest pronotal width . .	5·30 mm.	5·50 mm.

Specimens examined. One ♂ (holotype) ; 1 ♀ (paratype), Java, (no precise locality), Horsfield (B.M., 1860–15 : presented by Secretary of the India Board ; collected by Dr. Horsfield, East India Company).

Holotype and paratype in British Museum (Nat. Hist.), London.

Ovum (Text-fig. 31, j). Cylindrical, narrower and somewhat curved at opercular end ; chorion glabrous ; very obscurely reticulate ; chorion and elevated area of operculum piceous ; differentiated portion of chorion whitish. 2·60 mm.

Centrocnemoides sumatrana sp. n.

(Text-fig. 32)

Colour. Testaceous and black with many of the low tubercles very pale apically. Segments 1 and 2 of rostrum with suffusion, segments 3 and 4 piceous. Postocular laterally with two narrow black stripes. Pronotum, pleura and sterna with strong black suffusion. Scutellum brown ; tubercles and apical spine testaceous. Corium

black with confluent spots, tubercles and suffusion pale testaceous ; membrane with strong fuscous suffusion basally and fuscous spots in cells and apically ; metathoracic wings yellow. Connexivum black with pale testaceous tubercles and suffusion ; abdomen ventrally strongly suffused with piceous laterally and with a linear piceous spot on segments 3–6 mid-ventrally. Tarsi piceous apically ; anterior and median tibiae with basal, median and apical piceous annulations, the margins of which

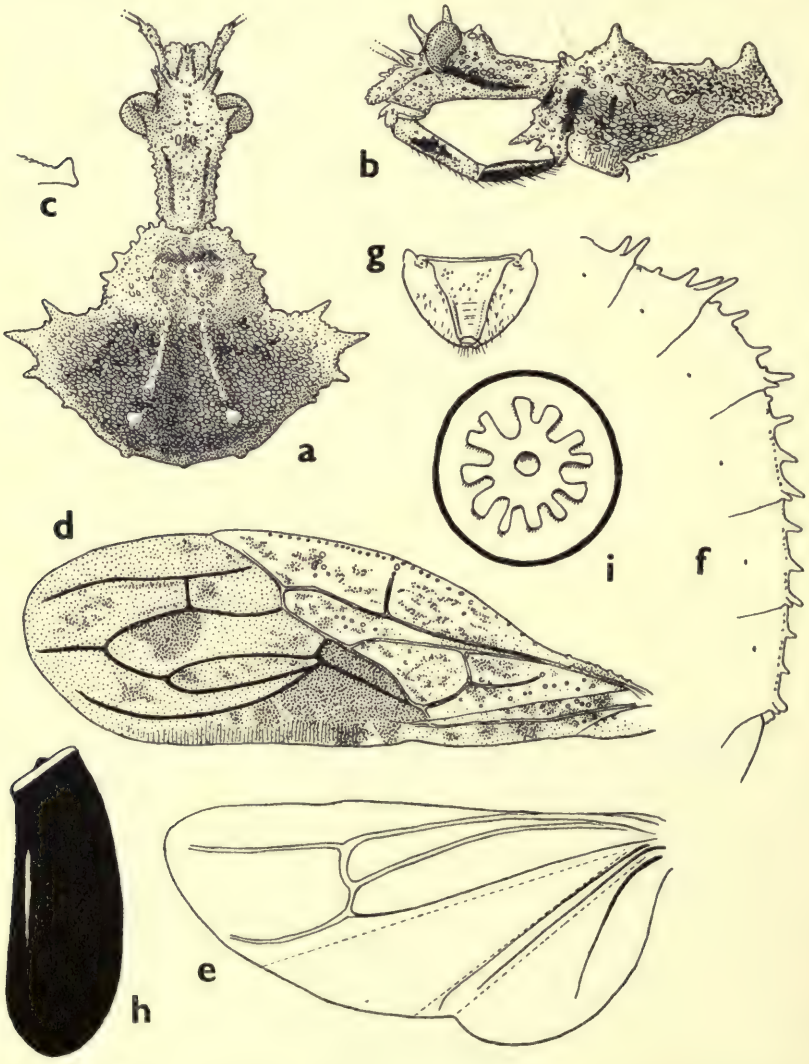

FIG. 32. *Centrocnemoides sumatrana* gen. n., sp. n. A. Head and pronotum (dorsal view) ; B. head, pronotum and mesopleural tubercles (lateral view); C. scutellar spine (lateral view); D. hemelytron; E. metathoracic wing; F. connexivum (ventral view); G. apex of abdomen, ♀; H. ovum; I. operculum.

somewhat ill-defined ; posterior tibiae with obscure brownish suffusion medially and apically ; anterior and median femora moderately, posterior femora strongly suffused with piceous ; trochanters testaceous ; coxae testaceous suffused with piceous.

Structure. Principal tubercles on basal rostral segment quadrate with the angles rounded. Costal margin of corium with moderately large tubercles basally. Carinae enclosing flattened area of abdomen ventrally moderately distinct and with a few low, rounded tubercles, some of which setigerous. Projections on posterior margin of posterior pronotal lobe moderately prominent, broadly rounded. Dorsal surface of connexival segments coarsely granulose or tuberculate ; apical margin of segments with rounded tubercles of varied sizes.

	♀
Total length	16·50 mm.
Hemelytra	9·50 mm.
Greatest pronotal width	6·00 mm.

Specimen examined. One ♀ (holotype), Sumatra, (no precise locality), Forbes (Distant coll., B.M., 1911–383).

Holotype in British Museum, (Nat. Hist.), London.

Ovum (Text-fig. 32, h). Cylindrical narrower at opercular end and somewhat curved ; chorion glabrous, very obscurely reticulate ; chorion and elevated area of operculum dark brown or piceous ; differentiated portion of chorion whitish. 2·60 mm.

Centrocnemoides drescheri sp. n.

(Text-fig. 33)

Colour. Testaceous. Head, pronotum and corium with strong black areas and suffusion. Tubercles on head, pleura and legs very pale. Membrane with a large spot basally at anal angle and spots and suffusion fuscous ; metathoracic wings yellow. Basal segment of rostrum suffused with black ; segment 2 with a wide, irregular median black annulation ; segments 3 and 4 piceous ; segment 3 light brown apically. Tarsi testaceous ; segment 3 piceous apically ; anterior and median tibiae with apex and a median annulation piceous; posterior tibiae with apex broadly and a very wide, somewhat obscure, dark brown median annulation ; anterior and median femora with large piceous areas ; posterior femora almost entirely piceous ; coxae piceous with tubercles and suffusion pale testaceous.

Structure. Principal tubercles on basal rostral segment broadly conical. Projections on posterior margin of posterior pronotal lobe very short, rounded. Dorsal surface of connexival segments with abundant granules ; apical margin of segments with a few, short, erect tubercles. Carinae enclosing flattened area of abdomen ventrally moderately distinct and granulose.

	♂	♀
Total length	14·00 mm.	18·00 mm.
Hemelytra	9·00 mm.	10·00 mm.
Greatest pronotal width	5·50 mm.	6·00 mm.

SPECIMENS EXAMINED. One ♂ (holotype) ; 1 ♀ (paratype), Java, Gunong Slamet, Batoerraden, 10 and 11–1927, F. C. Drescher.

Holotype and paratype in Zoologisch Museum, Amsterdam, The Netherlands.

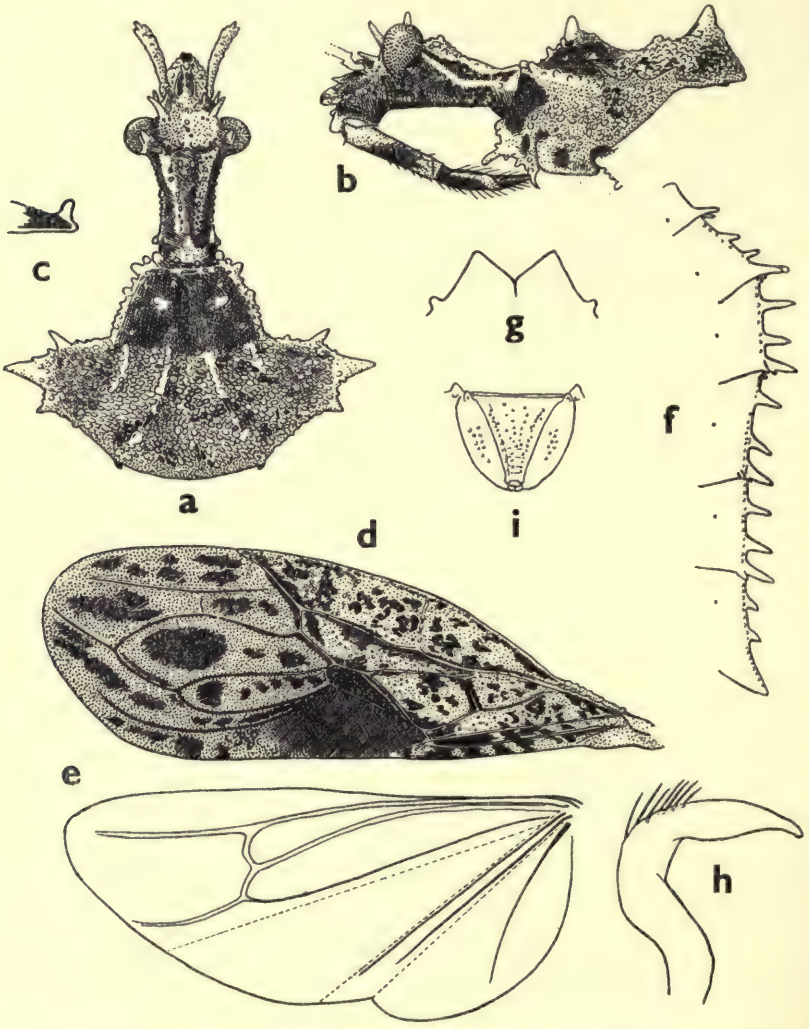

FIG. 33. *Centrocnemoides drescheri* gen. n., sp. n. A. Head and pronotum (dorsal view) ; B. head, pronotum and mesopleural tubercles (lateral view) ; C. scutellar spine (lateral view) ; D. hemelytron ; E. metathoracic wing ; F. connexivum (ventral view) ; G. apex of abdomen ♂ ; H. harpago ; I. apex of abdomen, ♀.

5th instar neanide (Text-fig. 3, E)

COLOUR. Testaceous. Basal segment of antennae, gula, postocular laterally, pronotum, mesonotum, abdomen dorsally strongly suffused with black ; connexivum

with somewhat obscure yellowish spots ; abdomen ventrally with confluent black spots and suffusion. Segment 2 of antennae with faint brownish suffusion sub-apically. Basal segment of rostrum suffused with black ; segment 2 with a sub-basal piceous annulation ; segments 3 and 4 piceous. Tarsi with apical segment piceous apically ; tibiae with apical, median and basal piceous annulations, the basal one somewhat indefinite ; femora strongly suffused with black. Coxae and trochanters black, the anterior pair of the former with testaceous suffusion.

STRUCTURE. Postocular with a slender, sub-erect spine sub-laterally. Stridulatory furrow well-developed. *Fossula spongiosa* on anterior and median tibiae represented by small groups of setae. Abdomen dorsally with a moderately long, erect tubercle close to gland ostioles, those near the basal ostiole widely separated. Propleural and mesopleural spiracles with elongate orifice. Total length 12 mm.

SPECIMEN EXAMINED. One 5th instar neanide (data as in adults).

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A STUDY OF AFRICAN CHIRONOMIDAE

PART II

PAUL FREEMAN

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 4 No. 7
LONDON: 1956

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PART II

BY

PAUL FREEMAN

Pp. 285—366 ; 17 *Text-figures.*

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A STUDY OF THE CHIRONOMIDAE (DIPTERA) OF AFRICA SOUTH OF THE SAHARA

PART II

By PAUL FREEMAN

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SYNOPSIS

Part I of this Study was published in No. 1 of Vol. 4 of the *Bulletin of the British Museum* (*Natural History*), pp. 1–67. Part II continues the description of the Chironomid fauna of Africa south of the Sahara and deals with the subfamilies Orthocladiinae and Corynoneurinae as well as giving additional information on a few of the species described in Part I and describing two new species of Tanypodinae.

Although the classification employed follows the broad outlines laid down by F. W. Edwards, his large genera have been split up more or less as was done by Goetghebuer. Eleven Orthocladiine genera are recognized for the African fauna, one being new; *Knepperia* Kieffer makes a twelfth, but is unrecognizable. There are species of two genera of Corynoneurinae. Many species very closely resemble Palaearctic species and the same species groups are often to be found in the two Regions. Keys are given to genera and species, nearly 90 species are described, 27 being new, and in addition notes are added on species described by Kieffer but which cannot be recognized.

INTRODUCTION

PART I of this Study was published as No. 1 of Vol. 4, of the *Bulletin of the British Museum* (*Natural History*) (1955). In Part I, in addition to descriptions of species,

details are given of the scope of the Studies, an Historical Survey of previous work on the Group and Methods of Collection, Examination, etc.; there is also an account of the Structure of adult Chironomids, some notes on Distribution and keys to the Subfamilies. Part II covers the subfamilies Orthocladiinae and Corynoneurinae, leaving the large subfamily Chironominae to be dealt with in later Parts.

Since the publication of Part I, I have received further large consignments of Chironomids from Sudan (Mr. E. T. M. Reid), Transvaal (Mr. A. D. Harrison) and Belgian Congo (collected by Dr. J. Verbeke on the Belgian Hydrobiological Expedition to the East African Lakes, Tanganyika, Kivu, Edward and Albert). There is also a small collection from Ethiopia (Dr. Max Ovazza). I should like to take this opportunity of thanking these gentlemen for making their collections available to me for study.

I have also visited the Musée Royal du Congo Belge, Tervuren, to study the types of Goetghebuer's species which were kindly placed at my disposal by Dr. P. L. G. Benoit of that Institute.

The additional material available has enabled me to describe the males and add more distributional data to two of the rarer species described in Part I and to describe two new species of Tanypodinae. The interpretations I made of Goetghebuer's species in Part I were correct with the exception of *Pentaneura interrupta* and *palpalis*. These I am correcting and I am adding notes on the type of *P. annulator*.

ADDITIONS TO PART I

Pentaneura (Pentaneura) annulator Goetghebuer

I have now seen the holotype female of this species and can state that it definitely belongs to the subgenus *Pentaneura* because the dorso-central bristles run straight across the prescutellar area which is scarcely indicated. The wing pattern is not nebulous as stated by Goetghebuer, but is quite definite.

Female. Wing length 1·4 mm.

Head dark brown, antennae with 12 segments. *Thorax* grey from pruinosity, all hairs long and yellow. *Legs* yellowish brown, knees plain, unmarked, apices of all tibiae dark brown, all tarsi broken, but annulated according to Goetghebuer. *Wings*

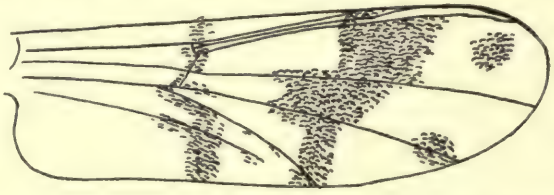

FIG. 1. Wing of holotype female of *Pentaneura annulator*.

distinctively patterned with dark macrotrichia as shown in fig. 1 (drawn free-hand from the holotype); halteres yellow. *Abdomen* black, hairs mostly pale and adpressed, cerci yellow.

Holotype female, BELGIAN CONGO: Kabasha, Chambi.

Pentaneura (Pentaneura) interrupta Goetghebuer

Ablabesmyia interrupta Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**, 361.
Ablabesmyia palpalis Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**, 362 (SYN. NOV.) *nec palpalis* Freeman, 1955, *Bull. Brit. Mus.* (*N.H.*) **4**, 32.
Pentaneura (*Pentaneura*) *interrupta* Freeman, 1955, *Bull. Brit. Mus.* (*N.H.*) **4**, 33.

I have now seen the holotype male of *interrupta* and the holotype female of *palpalis* in the Musée Royal du Congo Belge. Both were collected at the same time in the same locality and I am in no doubt that they are the two sexes of the same species. The female from Natal referred by me to *palpalis* in 1955 is different and may be the female of *longipes*, at any rate it is insufficiently distinct for a new species to be described based on the female alone.

The distinguishing feature of *interrupta* lies in the wing markings. The basal half of the wings and the apex are covered with dark macrotrichia so as to appear grey, the intermediate area bears pale macrotrichia (couplet 11 of my key needs modifying). Goetghebuer was wrong in stating that there is a transverse grey band ; he also overlooked the pale subapical area in *palpalis*. The male abdomen is less distinctively marked than stated by Goetghebuer, all basal segments carry a central brown band, but it is rather more distinct on segment 3. Couplet 16 should be amended to run out to " ? *longipes* ♀."

ADDITIONAL LOCALITY. TRANSVAAL : 1 ♂, 1 ♀, Sabie, ix.1954 (*A. D. Harrison*).

Pentaneura (Pentaneura) ovazzai sp. n.

A fairly large species with definite black and white abdominal markings ; knees faintly brown, hypopygium simple and not of the *cygnus* type ; wings plain, separating it from the others with darkened knees (see my key, 1955, p. 22, couplet 5). Probably most nearly allied to *edwardsi* Freeman, from which it can be distinguished by the faint brown knees and strongly marked abdomen.

Male. Wing length 3·0 mm.

Head and mouthparts yellowish, vertex more brown, antennae brown, A.R. 1·2. *Thorax* with yellowish background ; stripes, sternopleuron and postnotum brown, pleura brown around wing bases, ventral darkening thus joined to lateral mesonotal stripes ; shoulders and prescutellar area pruinose ; bristles yellow. *Legs* pale yellow, knees and apices of tibiae with vague brown tinges ; anterior tibiae slightly longer than femora, middle ones equal, posterior tibiae about one and a half times as long as femora ; L.R. 0·8. *Wings* plain and with venation and shape quite similar to *edwardsi* (Pt. I, Text-fig. 7, *a*), clothed uniformly with dark macrotrichia and with no markings due either to staining or to areas of dark macrotrichia. Halteres whitish. *Abdomen* white with brownish black basal bands on some of the segments : segment 1 white, 2 white with vague indications of lateral basal darkenings, 3 and 4 white with basal halves dark, 5 white with basal darkening reduced to lateral dark areas, 6 and 7 with basal two-thirds brownish black, 8 totally white, hypopygium brown. Styles straight, coxites in dry specimen apparently lacking basal appendages.

Holotype male, ETHIOPIA : Addis-Alem, 26.vi.53 (*M. Ovazza*) in British Museum.

Tanypus fuscus Freeman

Further material enables me to confirm that it is a distinct species and not a variety of *brevipalpis*. Both sexes are now available and the male resembles the female in colour, pattern and in the unusually large size of the mesonotal tubercle.

ADDITIONAL LOCALITIES. SUDAN: 1 ♀, Wunatong nr. Wau, iii.1955 (*E. T. M. Reid*). UGANDA: 1 ♂, Jinja (*P. S. Corbet*). BELGIAN CONGO: 1 ♂, 2 ♀, Vitshumbi (Lake Edward), i.1953 and 1 ♂, Kasenyi, ii.1953 (*J. Verbeke*).

Clinotanypus verbekei sp. n.

In size and appearance not unlike *claripennis*, but thorax quite different in pattern and colour. Thorax mainly black, stripes separate, anterior tarsi bearded, abdomen of male yellow, banded with black, of female entirely black. In my key in part I (p. 52) an extra couplet is necessary to include this species and *claripennis* which can then be separated by the thoracic pattern; couplet 3 will require the removal of "female thorax without black markings" and the replacement of "*claripennis* Kieffer" by the figure 4.

Male. Wing length 3·0 mm.

Head dark brown, antennae and plumes very dark or blackish, A.R. about 3·5. *Thorax* very dark, blackish with some pruinosity; stripes separated by narrow yellow pruinose lines, dorso-central yellow line with a lateral branch in the humeral region outlining the shoulders which are black; prescutellar area slightly paler brown, prothorax pale; all bristles and hairs short, inconspicuous and yellow; mesonotal tubercle absent. *Legs* with coxae, apices of tibiae, tarsal segments 4–5 of all legs and 2–5 of front legs black, remainder of legs yellow; femora variably infuscated; anterior tarsi with long but not dense beard on segments 2–3; L.R. 0·8. *Wings* clear, crossvein r-m clouded, venation as in *claripennis*; halteres black. *Abdomen* yellow, segments 3–8 with dark markings, hypopygium black; segments 3–4 with a dark band in apical half, 5 with dark marks more or less reduced to lateral spots, 6–8 with black bands occupying apical halves; segment 2 sometimes with trace of dark band similar to 3.

Female. Antennae with 14 segments; thorax and legs as in male, except for absence of beard, wings rather darker anteriorly as in *claripennis*, abdomen totally black, without any trace of yellow pattern.

Holotype male and 5 ♂, 3 ♀, paratypes, BELGIAN CONGO: Albertville (Lac Tanganyika) 8–18.viii.1953 (*J. Verbeke*), holotype and 5 paratypes in Institut Royal des Sciences Naturelles de Belgique, 3 paratypes in British Museum.

Procladius (Procladius) maculosus Freeman

I now have a male of this species. It is very similar to the female; A.R. 1·5, plumes whitish, darker apically; thorax and wings as in the female; legs white, tibiae and tarsal segments 1–3 black at apices, segments 4–5 totally black, L.R. 0·75. Abdomen whitish, each segment dark and with dark hairs at base.

SUDAN: 1 ♂, Liednum, nr. Wau, iii–iv.1955 (*E. T. M. Reid*).

SUBFAMILY ORTHOCLADIINAE

The following is a definition of the subfamily: Eyes typically reniform, seldom with dorsal narrow portion ; male antennae normally plumose and with 14 segments, female antennae usually with 5–7 segments. Pronotum collar-like, never divided into separate lateral lobes, postnotal furrow usually distinct ; anepisternal suture well developed. Anterior tibia always with a distinct spur, anterior basitarsus always shorter than tibia ; middle tibia usually with two spurs and no comb ; posterior tibia usually with two spurs, the inner the longer, and usually with a comb of free spinules on the inner side. True base of M_{3+4} never developed, R_{2+3} never connected to R_1 by a cross-vein, R_{4+5} not fused with costa to form a clavus. Hypopygium not inverted, styles movable, folded inwards in repose (except perhaps in some species of *Smittia* Wulp and ? *Knepperia* Kieffer).

I have seen material of more than 80 species of this subfamily from Africa south of the Sahara. With certain exceptions, such as some species of *Cricotopus* and occasional species of other genera, the Orthocladiinae are most abundant in, and typical of, South Africa and the mountainous areas of East Africa. As mentioned in Part I this is in accordance with the work of entomologists studying the fauna of the Palaearctic Region where it has been noted that the Orthocladiinae are especially typical of cold water habitats.

An interesting feature is the great similarity between the African and European Orthocladiine faunas. Sometimes I have been doubtful whether the species are really distinct. One East African species I have decided is identical with the European *Chaetocladius melaleucus* Meigen, and a South African species I have considered to be no more than a race of the European *Chaetocladius excerptus* Walker. Wherever possible I have mentioned the closest European ally and given reasons for considering them to be distinct. Most of the species fall into the groups and genera recognized by Edwards and Goetghebuer in their works on the British and Palaearctic species.

Edwards (1929, *Trans. ent. Soc. Lond.* **77**, 279–430) used very large genera which he subdivided into subgenera, species groups and series. His classification basically is extremely sound, but the large genera are unwieldy and difficult to use. Later authors, especially Goetghebuer in Lindner's *Die Fliegen der Palaearktischen Region*, have discarded Edwards' concept of large genera, although they follow the main features of his basic classification.

Many Chironomids are hard to separate into clear-cut species and there is a good deal of intergrading. It follows that the differences at generic level are not always going to be strongly marked and there seems to be no reason why the allied species groups of Edwards' classification should not be considered as genera, and this I propose to do. My classification to a great extent follows that of Goetghebuer, but I have not hesitated to modify it where necessary.

Edwards (1929) brought forward a controversial issue in his use of the genus *Spaniotoma* Philippi. This entailed the use of a single large genus, *Spaniotoma*, for all the Orthocladiinae except *Metriocnemus*, *Brillia*, *Eurycnemus*, *Cricotopus* and *Cardiocladius* and some aberrant genera. *Orthocladius* was employed as a subgenus

TABLE I.—*Species of Orthocladiinae and Corynoneurinae Described by Kieffer*

Date.	Original name	Position in present study
1908 .	*Knepperia gracilis* .	*Knepperia* gen. incert.
1911 .	*Dactylocladius mahensis* .	*Smittia mahensis*
	D. melanostolus .	*S. melanostolus*
	D. xanthostolus .	*S. melanostolus*
	D. heterostolus .	*S. melanostolus*
	D. megalochirus .	*Orthocladius megalochirus*
	Corynoneura seychellensis .	*Corynoneura seychellensis*
	Metriocnemus mahensis .	*Metriocnemus mahensis*
	Trichocladius 4-fasciatus .	*Cricotopus 4-fasciatus*
1913 .	*Allocladius niger* .	*Smittia nigra*
	Psectrocladius alpinus .	*Orthocladius alpinus*
	Dactylocladius lacustris .	*? Orthocladius lacustris*
	D. sancti-benedicti .	*? O. sancti-benedicti*
	D. kinangopi .	*? O. kinangopi*
	Nanocladius vitellinus .	*Nanocladius vitellinus*
1914 .	*Camptocladius natalensis* .	*Limnophyes natalensis*
	C. capensis .	*? Smittia capensis*
1918 .	*Camptocladius pretorianus* .	*? Orthocladius pretorianus*
	C. guineensis .	*Smittia guineensis*
	C. nigerrimus .	*Orthocladius nigerrimus*
	Dactylocladius micans .	*Trichocladius micans*
	D. pallidus .	*Chaetocladius pallidus*
	Trichocladius guineensis .	*? Trichocladius guineensis*
1923 .	*Kribiocladius flava* .	*? Thienemanniella flava*
	Dactylocladius nilicola .	*? Orthocladius nilicola*
	Trichocladius atriclava .	*Cricotopus atriclava*
	T. albiclava .	*? Trichocladius albiclava*
	T. pictiventris .	*Cricotopus pictiventris*
	T. kribiensis .	*Cricotopus albitibia* Walker
	Camptocladius longicosta .	*Smittia guineensis* Kieffer
	C. kribiensis .	*? Smittia kribiensis*
1924 .	*Psectrocladius rhodesiae* .	*Cryptochironomus* (*!*)—see under *Psectrocladius*.

TABLE II.—*Species of Orthocladiinae and Corynoneurinae Described by Goetghebuer*

Date	Original name	Position in present study
1934 .	*Cricotopus kisantuensis* .	*Cricotopus kisantuensis*
	C. bicinctus var. *plumbeus* .	*C. albitibia* Walker
	C. tricinctellus .	*C. tricinctellus*
	C. dewulfi .	*Trichocladius micans* Kieffer
	C. cereofasciatus .	*T. cereofasciatus*
	Limnophyes brevis .	*Limnophyes natalensis* Kieffer
	Eukiefferiella metallescens .	*Trichocladius metallescens*
	Smittia longicostalis .	*Smittia guineensis* Kieffer
1935 .	*Corynoneura dewulfi* .	*Corynoneura dewulfi*
	Thienemanniella chambiensis .	*Stempellina chambiensis* (*!*)
	T. trivittata .	*Thienemanniella trivittata*
1936 .	*Metriocnemus dewulfi* .	*Metriocnemus dewulfi*
	Smittia maculipennis .	*Smittia maculipennis*

of *Spaniotoma*. It seems to me that the identity of *Spaniotoma* is in doubt, as Edwards himself admits in a footnote (1929, 327) and I am not prepared to accept this name for the larger part of the subfamily. The use of smaller genera automatically restricts *Spaniotoma* and I am proposing to reject it on grounds of uncertain identity.

Edwards (1940, *Proc. R. ent. Soc. Lond.* (B) **9**, 154–6) later suggested that *Spaniotoma* should be replaced by the earlier name *Hydrobaenus* Fries. *Hydrobaenus* was originally proposed for a somewhat aberrant species which, according to Edwards, has been redescribed by both Kieffer and Goetghebuer in the genus *Trissocladius*. Again, with the use of smaller genera, *Hydrobaenus* is best regarded as a separate genus, leaving *Orthocladius* as a full genus.

Neither the genera nor the species of the Orthocladiinae are easy to separate. A useful character lies in the size of the microtrichia on the wing membrane. If the wing of a dry or slide-mounted specimen of a species without macrotrichia on the membrane is examined under a monocular microscope then the microtrichia can readily be seen as distinct hairs only in the two genera *Chaetocladius* and *Limnophyes*. Sometimes a 2/3 in. objective is sufficient, with other species a 1/6 in. objective may be necessary. Edwards tried to correlate the size of the microtrichia with the colour of the wings as seen by transmitted light: where they were distinguishable the wing was colourless, where they were either absent or too small to be distinguished as hairs, then the wing showed some brown or purple colour. I prefer to look for the microtrichia themselves rather than to rely on the colour character, though it often acts as an indication.

Kieffer has described 30 species of Orthocladiinae from Africa south of the Sahara, I have seen the types of 17 of these. Table I shows either their true position in a modern classification, or their estimated position for those in which the types are lost and the description poor. Each is discussed under its appropriate genus.

Goetghebuer has described nine species and one variety of a Palaearctic species. I have seen the types of all of his species which are in Musée Royal du Congo Belge. Table II shows his species with their appropriate positions in this Study.

Key to Genera of Orthocladiinae Known from Africa South of the Sahara

(*Knepperia* Kieffer omitted owing to insufficient data)

1. Wing membrane bearing macrotrichia, at least at apex . . . *Metriocnemus* Wulp
   Wing membrane without macrotrichia 2
2. Vein R_{2+3} running close to R_{4+5}, obsolete apically and not ending distinctly in costa *Nanocladius* Kieffer
   R_{2+3} not like this, ending distinctly in costa 3
3. Squama completely bare 4
   Squama with at least a partial fringe of 2–3 hairs, usually with a complete fringe . 5
4. Postnotum with well developed fissure; tibial spurs present on middle legs; eyes occasionally with short pubescence, usually bare . . . *Smittia* Holmgren
   Postnotal fissure absent; spurs absent from middle tibiae; eyes densely pubescent; male antenna 6-segmented . . . . . *Harrisonina* gen. nov.
5. Eyes pubescent 6
   Eyes bare 7

6. Dorso-central hairs minute and decumbent, tibiae often with white ringe or completely white, humeral pits small . . . . . *Cricotopus* Wulp
   Dorso-central hairs erect and normal; tibiae not ringed; humeral pits often large *Trichocladius* Kieffer
7. Fourth tarsal segment cordiform . . . . . *Cardiocladius* Kieffer
   Fourth tarsal segment cylindrical 8
8. Pulvilli large and broad . . . . . *Psectrocladius* Kieffer
   Pulvilli small, narrow or absent 9
9. Wing membrane without microtrichia distinguishable under 1/6 in. objective; membrane usually brownish by transmitted light . . . . *Orthocladius* Wulp
   Microtrichia easily distinguishable with 1/6 in. objective; membrane colourless by transmitted light 10
10. Cu_1 strongly bent near the middle; posterior fork well beyond r–m cross-vein; anal lobe of wing reduced . . . . . *Limnophyes* Eaton
    Cu_1 not strongly bent, often almost straight; posterior fork below or only slightly beyond r–m; anal lobe present . . . . . *Chaetocladius* Kieffer

Genus ***METRIOCNEMUS*** van der Wulp

Metriocnemus van der Wulp, 1874, *Tijdschr. Ent.* **17**, 136; Kieffer, 1911, *Trans. Linn. Soc. Lond.*, (*Zool.*) **14**, 360; Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 310; Goetghebuer, 1936, *Rev. Zool. Bot. Afr.* **28**, 491.

Wings with distinct macrotrichia on the membrane, at least at the tip; cross-vein r-m rather short; eyes bare (in African species); pulvilli absent; scutum not produced in front, pronotum forming a distinct collar; male styles not bifid; hind tibiae with comb as usual.

All the species of Orthocladiinae with macrotrichia on the wing membrane known to me from Africa fall into this genus. They are quite similar to Palaearctic species. Not all the species groups recognized by Edwards (1929) are represented, groups B and C being absent and D, E and F not clearly separable. For these reasons, I am not adhering closely to Edwards' groupings. I have seen specimens of all the described species but it seems probable that there are still quite a number of species to be found, especially in the mountainous parts of Africa.

Key to African Species of *Metriocnemus*

1. Shoulders and mesonotum blackish or blackish brown 2
   Shoulders yellow, mesonotal stripes brown, often separated 7
2. Macrotrichia confined to tip of wing (at least in male), acrostichal bristles absent, anal lobe of male prominent . . . . . *fletcheri* sp. n.
   Macrotrichia evenly and densely distributed over most of wing or at any rate over apical half and margin of anal cell, anal lobe slight 3
3. Acrostichal bristles present, wing length at least 2·0 mm. 4
   Acrostichal bristles absent, wing length 2·0 mm. or less 6
4. Macrotrichia more sparse, present at most only on apical half of wing of male and along margin of anal cell, female unknown . . . . . *lobeliae* sp. n.
   Macrotrichia evenly and densely distributed over entire wing surface . . . 5
5. Male styles narrowed at apex, anal point short (Text-fig. 3, *b*) . . *canus* Freeman
   Male styles wide at apex, anal point longer . . . . . *wittei* Freeman
6. Anal point of male long (Text-fig. 3, *g*) . . . . . *fordi* sp. n.
   Anal point of male very short (Text-fig. 3, *f*) . . . . . *capensis* sp. n. ♂

7. Squama bare, macrotrichia very restricted in only known male, only present at extreme apex, in female with bare lines along veins 8
Squama fringed, macrotrichia more abundant 9
8. Posterior fork narrower, similar to *fordi* (Text-fig. 2, *f*), female without macrotrichia nearer to anterior margin than apex of costa . . . . . *benoiti* sp. n.
Posterior fork distinctly wider, Cu_1 more sharply bent, female with macrotrichia anterior to apex of costa, species from Seychelles . . . . *mahensis* Kieffer
9. Large species wing length 3·0 mm., eyes of male without dorsal narrow portion *conicus* Freeman
Wing length 2·0 mm. or less 10
10. Acrostichal bristles absent, L.R. practically 1·0 . . . . . *capensis* sp. n. ♀
Acrostichal bristles present, L.R. at most 0·8 11
11. Costa retracted (Text-fig. 2, *d*) . . . . . *dewulfi* Goetghebuer
Costa longer (Text-fig. 2, *c*) . . . . . *scotti* Freeman.

Metriocnemus wittei Freeman

Metriocnemus wittei Freeman, 1955, *Explor. Parc Nat. Albert*, Miss. G. F. de Witte, fasc. 83, 9.

This species is a typical member of Edwards' Group A. It is all black, halteres dark, thoracic bristles usually pale, wings densely hairy all over, anal lobe of wing not produced, male styles not narrowed at apex, anal point bare and of medium length.

It seems to be quite variable, some specimens having golden thoracic hairs, others having these hairs darker or almost blackish. In addition, in the types series A.R. is 2·5, but in other specimens it may be as low as 1·0. The insects are so generally similar that I hesitate to place these in a separate species.

Male. Wing length 2·0–2·5 mm.

Head black, palpi normal; eyes bare and without narrow portion; vertex with a few whitish hairs but lacking scale tufts; antennal plumes blackish, A.R. varying from 1·0 to 2·5. *Thorax* completely black, slightly shining, somewhat pruinose along the hair lines; acrostichal bristles varying from golden yellow to blackish and more or less uniserial, dorso-centrals similarly coloured and irregularly triserial, becoming more regular and numerous on shoulders. *Legs* blackish with black hairs; front L.R. 0·7, hind L.R. 0·45 or slightly less, pulvilli absent, empodium well developed. *Wings* yellowish basally, densely and evenly clothed with macrotrichia, stem vein and squama with well developed long hairs, anal lobe slight (Text-fig. 2, *a*); venation as in Text-fig. 2, *a*, R_{2+3} ending nearer R_1, costa produced, R_{4+5} ending before level of tip of M_4, posterior fork fairly narrow, Cu evenly curved, anal vein reaching fork. Halteres black or dark brown. *Abdomen* black, very slightly paler at the incisures, hairs mostly blackish. Hypopygium (Text-fig. 3, *a*) with well developed bare anal point, inner coxite lobe slightly developed, style not narrowed at apex.

Female. Generally similar to male, abdomen rather browner, wings with the usual sexual differences of greater breadth and denser macrotrichia.

Holotype in collection of Institut des Parcs Nationaux du Congo Belge.

DISTRIBUTION. ABYSSINIA: 1 ♂, Koram Plain, 3.xi.36 (*J. W. S. Macfie*). UGANDA: 1 ♂, 3 ♀, Musandama, 8,000 ft., xi.31 (*E. G. Gibbins*); 1 ♂, Ruwenzori Range, Mahoma River, 6,700 ft., viii.52 (*D. S. Fletcher*). BELGIAN CONGO: 1 ♂, N.

Kivu, Kibati, x.33 (*de Wulf*); type and paratype, Lac Magera, 2,000 m., iii.34 (*G. F. de Witte*). TRANSVAAL: 1 ♂, Pretoria, Lynnwood, iii.54 (*Rudebeck*).

Gibbins' specimens were bred from larvae found in the axils of wild bananas, a habitat similar to that of the Palaearctic species *M. martinii* Thienemann, which breeds in water in rot-holes in trees.

Metriocnemus lobeliae sp. n.

Very similar to *M. wittei*, but thoracic hair all jet black and wing membrane of male (female unknown) with reduced macrotrichia. It may be a variety of *wittei*, especially as the breeding habitat is similar.

Male. Wing length 2·5 mm.

Head black, eyes without dorsal narrow portion, vertex with a few dark hairs, antennae blackish, plumes dark, A.R. about 1·5. *Thorax* completely black, slightly shining and pruinose, except for scutellum, which is paler; all hairs black, acrostichal bristles well developed, dorso-centrals irregularly biserial. *Legs* black; similar to *wittei*, except front L.R. 0·5, but this may be variable. *Wings* yellowish basally, with similar venation to *wittei* (Text-fig. 2, *a*); macrotrichia much sparser, in basal half of wing only present as a single or double row just inside margin of

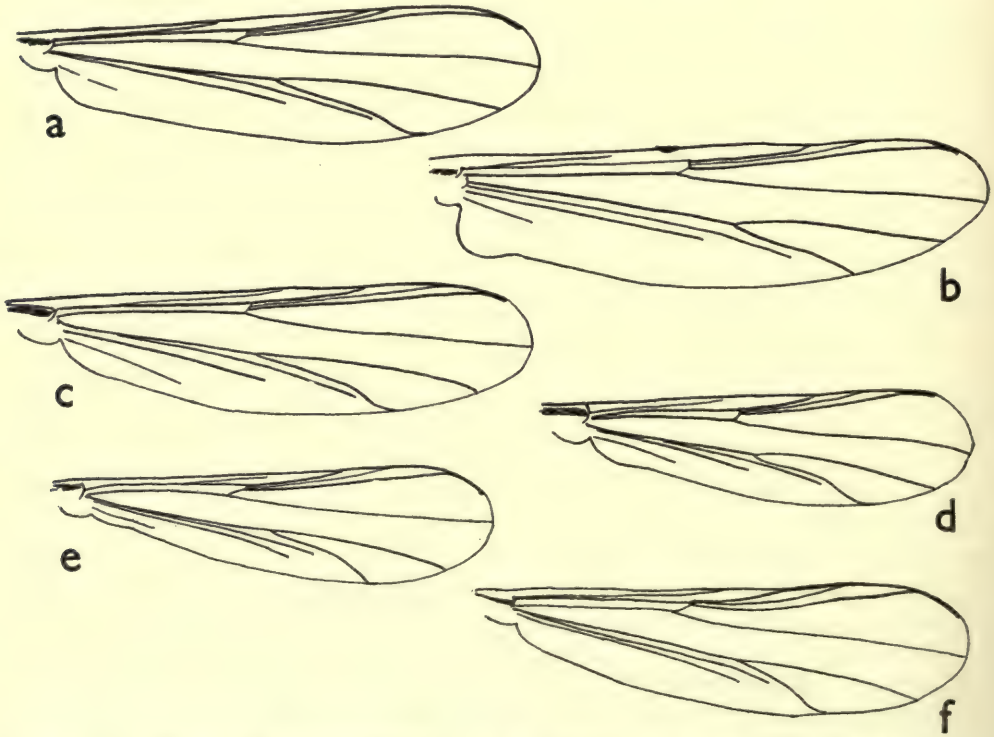

FIG. 2. Wings of male *Metriocnemus*. (*a*) *M. wittei*; (*b*) *M. fletcheri*; (*c*) *M. scotti*; (*d*) *M. dewulfi*; (*e*) *M. capensis*; (*f*) *M. fordi*.

anal cell; in apical half present at tips and sparsely along cells R_5 and M_2, cell M_4 with a few at apex. *Abdomen* and hypopygium similar to *wittei*; anal point possibly rather shorter, but this may be variable.

Female not known.

Holotype male and paratype 1 ♂, KENYA: Aberdare Range, Mt. Kinangop, 12,000 ft., x.34 (*F. W. Edwards*).

Both specimens were bred from larvae found in leaf axils of *Lobelia sattimae*.

Metriocnemus canus Freeman

Metriocnemus canus Freeman, 1954, *Arch. Hydrobiol.* **48**, 441.

This species is also a typical member of Edwards' Group A and is very similar to *wittei*, from which it is best distinguished by the male hypopygium, the styles being narrower apically and the anal point shorter; thorax quite strongly pruinose, wings yellowish basally.

Male. Wing length 3·0 mm.

Head black, palpi brown, antennae dark, plumes black, A.R. 1·0. *Thorax* quite black, pruinose and rather shining; mesonotum seen from behind with two admedian grey pruinose stripes lying between the dorso-central and acrostichal bristles, lateral and prescutellar areas less pruinose; seen from different angles the pattern changes; dorso-central bristles in about three rows, additional bristles present on shoulders and above wings, bristles pale or black. *Legs* almost black; front L.R. about 0·5, hind L.R. about 0·4, pulvilli absent. *Wings* yellowish basally, membrane clothed all over with dark macrotrichia, squama strongly fringed, venation exactly similar to *wittei* (Text-fig. 2, *a*), anal lobe similarly small. Halteres brown. *Abdomen* blackish brown, paler at the incisures and at the extreme base; hypopygium (Text-fig. 3, *b*) with short but distinct anal point, IXth tergite hairy, coxite with small inner lobe near apex, styles slightly thicker basally, narrow at apex.

Female. Wing length 3·4 mm.

Similar to male, abdomen rather browner, antennae with last segment hardly longer than preceding one.

Holotype in British Museum.

DISTRIBUTION. KENYA: 2 ♂, Aberdare Range, Nyeri Track, 10,500 ft. x.34 (*F. W. Edwards*) (type locality). UGANDA: 1 ♀, Kigezi Distr., Mt. Muhavura, 10–12,000 ft., vii.52 (*D. S. Fletcher*). BELGIAN CONGO: 1 ♂, Parc National Albert, Nyiragongo, limit of vegetation, 3,000 metres, 1933 (*de Wulf*).

Metriocnemus fletcheri sp. n.

An all black species readily distinguished from the previous ones by the absence of acrostichal bristles, the prominent anal lobe to the wing, the reduced wing macrotrichia and by the hairy anal point of the male.

Male. Wing length 2·5 mm.

Head, mouthparts, antennae and plumes black; A.R. about 2·0, eyes bare and without dorsal narrow portion. *Thorax* completely black, rather shining and slightly

pruinose ; dorso-central bristles long, black and uniserial, acrostichals appear to be absent. *Legs* dark brown or blackish, anterior L.R. 0·75, posterior 0·6. *Wings* yellowish basally, anal lobe prominent (Text-fig. 2, *b*), venation not unlike *wittei*, posterior fork rather shorter ; macrotrichia black and reduced in number, present only at apices of cells R_5 and M_1, and at extreme tip of fork cell ; halteres blackish. *Abdomen* black and with black hairs ; hypopygium (Text-fig. 3, *d*) differing from the other species not only in the presence of a definite coxite lobe and in the shape of the style, but also because the main area of the ninth tergite is bare, whilst the long anal point is hairy.

Female not known.

Holotype male and 2 male paratypes, UGANDA : Ruwenzori Range, Mahoma River, 6,700 ft., viii.52 (*D. S. Fletcher*). TANGANYIKA : 8 ♂, Amani iv.1955 (*M. T. Gillies*). Holotype and all paratypes in British Museum.

Metriocnemus conicus Freeman

Metriocnemus conicus Freeman, 1955, *Explor. Parc Nat. Albert*, Miss. de Witte, fasc. 83, 8.

A large and distinctive blackish species, distinguished from the other black species by the separate scutal stripes. Wings densely clothed with macrotrichia over whole surface, R_{4+5} and costa longer than usual, anal point probably broken in the unique specimen.

Male. Wing length 3·0 mm.

Head brownish black, eyes bare, without dorsal narrow portion, vertex with tufts of scale-like hairs of a golden brown colour ; antennal plumes dark, A.R. about 1·8. *Thorax* mainly black ; mesonotal stripes dull blackish and separated ; shoulders, lines of bristles, lateral margins, apex of scutellum, pleural membrane, wing bases and prothorax, yellowish and pruinose. Acrostichal bristles golden brown, uniserial ; dorso-centrals also golden brown, irregularly biserial and tending to disappear on the shoulders. *Legs* dark brown, anterior L.R. about 0·75, posterior tarsi missing, pulvilli and empodium both absent. *Wings* with membrane thickly clothed with macrotrichia which are numerous in cell M_1 right to the wing base ; venation not unlike *wittei* but costa longer and R_{4+5} ending well beyond M_4, Cu_1 not bent, anal vein passing fork ; stem vein and squama abraded, but both probably hairy. Halteres yellow, stem slightly brownish. *Abdomen* black, with some pruinosity along the mid-dorsal line and at the incisures ; hairs pale. Hypopygium (Text-fig. 3, *c*) apparently lacking anal point, but this is probably broken off ; IXth tergite hairy and conical, inner lobe of coxite hardly developed, style fairly thick and with a small apical spine.

Holotype male in collections of Institut des Parcs Nationaux du Congo Belge, type locality, BELGIAN CONGO : Ruanda, Sabinyo (Volc.), Vall. Rwebeya, 3,000 m., ix.34 (*G. F. de Witte*). No other specimens known.

Metriocnemus scotti Freeman

Metriocnemus scotti Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 129.

This is the most widely distributed of the African species and seems to belong to Edwards' Group E. It is a medium-sized brown species with separate scutal stripes,

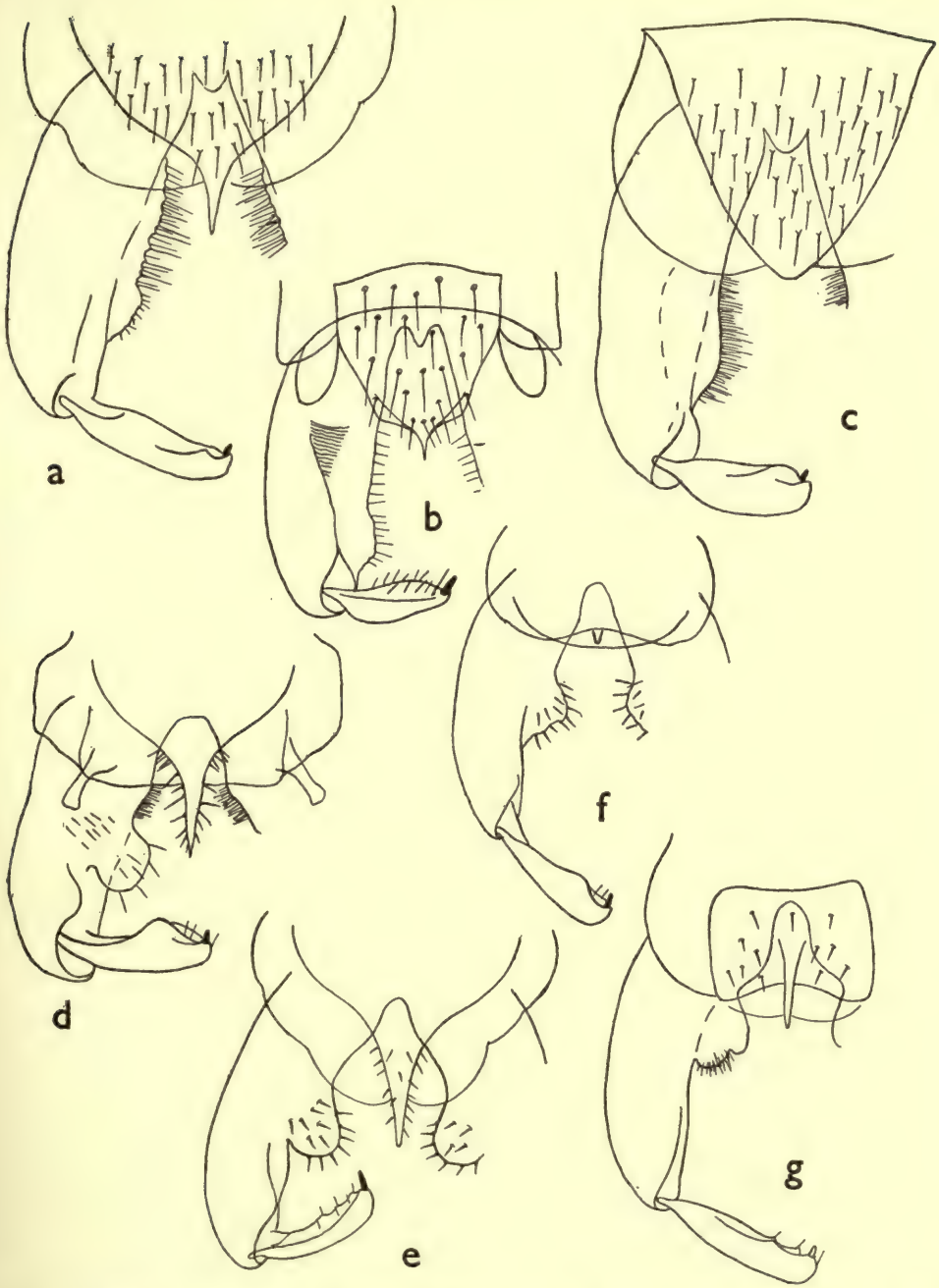

FIG. 3. Male hypopygia of *Metriocnemus*. (*a*) *M. wittei*; (*b*) *M. canus*; (*c*) *M. conicus*; (*d*) *M. fletcheri*; (*e*) *M. scotti*; (*f*) *M. capensis*; (*g*) *M. fordi*.

eyes of male with dorsal narrow portion, anal point hairy. Distinguished from *dewulfi* by the longer costa and greater number of macrotrichia on the wing.

Male. Wing length 1·75–2·0 mm.

Head yellow or brown, mouthparts darker, pedicel dark brown, A.R. about 0·8–1·0, antenna with about 10 curly hairs at apex, eyes with dorsal narrow portion. *Thorax* with yellow ground colour; mesonotal stripes separate, brown, central one more or less divided, intervening spaces and shoulders pruinose ; scutellum yellowish, postnotum and sternopleuron brown. *Legs* yellowish brown, unmarked and hairy ; L.R. 0·75, of posterior legs 0·6 ; pulvilli absent. *Wings* hyaline, macrotrichia present quite thickly over most of the surface, absent for a narrow tract along each vein, so that in the basal half of the posterior fork there is only a single row ; venation as in Text-fig. 2, *c*, posterior fork directly below r-m, Cu with a double bend. Halteres pale. *Abdomen* brown ; hypopygium as in Text-fig. 3, *e*, similar to that of *dewulfi*, anal point hairy, IXth tergite bare, coxite lobe prominent.

Female. Resembles male ; wing hairs denser, so that basal half of posterior fork has two or three rows.

Holotype male in British Museum.

DISTRIBUTION. ABYSSINIA : 1 ♂, 1 ♀, Dessie, xii.35–i.36 (*J. W. S. Macfie*). KENYA : 1 ♂, Aberdare Range, Mt. Kinangop, 8,000 ft., x.34 (*F. W. Edwards*). UGANDA : 1 ♂, Ruwenzori Range, Kilembe, 4,500 ft., xii.34–i.35 (*F. W. Edwards*). N. RHODESIA : 1 ♂, Chilanga, vii.1913. NATAL : 1 ♂, 2 ♀, Tugela River, Drakensberg, 5,000 ft. (*A. D. Harrison*). CAPE PROVINCE : various specimens from Kirstenbosch (type locality), Platteklip Gorge and Assegaibos (*K. M. F. Scott*).

Metriocnemus dewulfi Goetghebuer

Metriocnemus dewulfi Goetghebuer, 1936, *Rev. Zool. Bot. Afr.* **28**, 491 ; Freeman, 1955, *Explor. Parc. Nat. Albert*, Miss. de Witte, fasc. 83, 8.

This species resembles *scotti* in the male hypopygium and in colour, but it is clearly distinct because of the retracted costa, reduced wing macrotrichia and shorter narrow part of the eye of the male ; also it is smaller. It appears on some characters to fall into Edwards' Group D, but on others into Group E.

Male. Wing length 1·25 mm.

Head and mouthparts brown ; antennae dark brown, A.R. about 1·0, apex of antenna with about 4 long curled hairs. *Thorax* yellowish with separate brown stripes, postnotum and sternopleuron brown ; acrostichal hairs present, dorsocentrals more or less uniserial. *Legs* brown, anterior L.R. 0·8, posterior 0·65, empodium present, pulvilli absent. *Wings* (Text-fig. 2, *d*) somewhat cuneiform, costa retracted, R_{4+5} ending well before level of tip of M_{3+4} ; macrotrichia reduced, hardly present in basal half of wing except in anal cell, a few sometimes in cell M. Squama fringed, halteres yellow. *Abdomen* brown, hypopygium apparently identical to that of *scotti* (Text-fig. 3, *e*).

Female. Resembles male, but costa longer and wings more densely clothed with macrotrichia, extending into basal half ; best separated from *scotti* by its smaller size.

I have seen the holotype, which is a male in Musée Royal du Congo Belge, Tervuren.

DISTRIBUTION. Type locality BELGIAN CONGO : Rutshuru ; besides the type I have seen 7 ♂, 3 ♀, Rutshuru, 1285 m., xii.33 and 2 ♂, 1 ♀, i.34 (*G. F. de Witte*). NATAL : 1 ♂, Mooi River, Keate's Drift, x.1954 (*W. D. Oliff*). TRANSVAAL : 2 ♀, nr. Johannesburg, iv.1955 (*A. D. Harrison*). S. RHODESIA : 1 ♂, Salisbury, ix–x.1954 (*E. T. M. Reid*).

Metriocnemus capensis Freeman

Metriocnemus capensis Freeman, 1954, *Proc. R. ent. Soc. Lond.* (B) **23**, 173.

A small species, male blackish, female yellowish brown ; acrostichal bristles absent, eyes lacking dorsal narrow portion in male ; A.R. only 0·25, L.R. about 1·0, costa strongly produced, squama fringed. This species falls best into Edwards' Group E.

Male. Wing length 1·4 mm.

Head, mouthparts and antennae blackish, eyes bare, without dorsal narrow portion, last antennal segment short, so that A.R. only about 0·25, apex with short hairs only. *Thorax* entirely blackish brown, slightly pruinose, acrostichal bristles absent, dorso-centrals biserial. *Legs* brown, L.R. of front pair practically 1·0, of hind pair 0·6, pulvilli absent, empodium well developed. *Wings* with a brownish tinge, clothed over most of the surface with macrotrichia which are absent only from the anterior part of the basal third ; costa strongly produced, reaching half-way to M, R_{2+3} ending about midway between R_1 and R_{4+5}, the latter ending aboue M_{3+4} (Text-fig. 2, *e*) ; stem vein and squama each with a single hair. Halteres pale. *Abdomen* dark brown, hypopygium (Text-fig. 3, *f*) with extremely short anal point, coxite lobe moderately developed.

Female. Much paler than male, yellowish brown, scutal stripes sometimes only vaguely indicated, wing macrotrichia denser, costa rather longer, squama with 1–2 hairs.

Holotype male in British Museum.

DISTRIBUTION. Known only from the type series, CAPE PROVINCE : Berg River, Assegaibos, vii.1952, v.1953 and viii.1953 (*K. M. F. Scott*).

Metriocnemus fordi sp. n.

A medium-sized species, blackish brown in colour, wings of male with macrotrichia on the apical half and in the anal cell. Thoracic stripes fused, acrostichal bristles absent, costa strongly produced, anal lobe absent, squama fringed ; anal point bare, eyes without narrow dorsal portions. Resembles *capensis* most closely, but easily distinguished from it and from other species by the long bare anal point.

This species does not fit easily into any of Edwards' groups. In his key it runs into Group E, but cannot be placed here because the eyes are reniform ; it is precluded from Group F by the presence of a squamal fringe.

Male. Wing length 1·8–2·0 mm.

Head dark brown, eyes bare and reniform, palpi yellowish, antennal pedicel dark brown, flagellum and plumes paler, A.R. varying from 0·75 to 1·0. *Thorax* blackish

brown, acrostichal bristles absent, dorso-centrals present, pale and biserial; thorax pruinose along the hair lines. *Legs* pale brown, L.R. of anterior legs 0·9, of posterior legs 0·6, pulvilli absent, empodium well developed. *Wings* (Text-fig. 2, *f*) with macrotrichia on apical half of wing and in the anal cell only, squama with partial fringe, anal lobe reduced, but not as small as in *capensis*; venation very similar to *capensis*, costa strongly produced, posterior fork well distal to crossvein. *Abdomen* dark brown; hypopygium (Text-fig. 3, *g*) quite characteristic, anal point long and bare, ninth tergite slightly emarginate apically and with some hairs, coxite lobe more or less bilobed, styles narrow and with two projections near apex.

Female not known.

Holotype male and 9 ♂ paratypes, UGANDA: Kigezi Province, summit of Mt. Sabinio, 11–11,500 ft., xi.1934 (*J. Ford*) all in British Museum.

Metriocnemus benoiti sp. n.

As explained under *Limnophyes*, Goetghebuer described his species *L. brevis* from a mixed series which included specimens of a species of *Metriocnemus*. This is a small species not unlike a number of others, but by far the closest to *M. mahensis* Kieffer from Seychelles, which it resembles in the wings of the female and in the bare squama. The male is not unlike *dewulfi* and has similar genitalia, but the macrotrichia are greatly reduced and the apex of the antenna lacks long curled hairs. It is distinguished from *mahensis* by the slightly narrower posterior fork and the fewer macrotrichia on the wing. I am naming this species in honour of Dr. P. L. G. Benoit, who has given me so much help with the types of Goetghebuer's species. It falls into Group F of Edwards' classification.

Male. Wing length 1·1 mm.

Head, mouthparts and antennae brown, A.R. 0·75, antennae with short hairs at apex, no long curled ones present; head of type sunken and eye shape difficult to see, but dorsal narrow portion probably absent. *Thorax* dark brown with some pruinosity along lines of dorso-central hairs; shoulders and upper parts of pleura yellow, stripes fused; acrostichal hairs cannot be seen. *Legs* yellowish brown, anterior L.R. 0·8, posterior 0·65, empodium present, pulvilli absent, *Wings* in shape and venation similar to *fordi* (Text-fig. 2, *f*), but costa only produced for about half the distance; squama bare, membrane with greatly reduced macrotrichia which are present only at extreme apex and as a central line in apical half of cell R_5. Halteres brown. *Abdomen* blackish, hypopygium similar to *scotti* and *dewulfi* (Text-fig. 3, *e*).

Female with scutal stripes partially separated, lines of bristles pruinose, wings with denser macrotrichia than male but fewer than *mahensis*. Macrotrichia more or less in lines reaching nearly to wing base, leaving bare lines along the veins, none nearer anterior margin than the greatly produced apex of the costa, well distributed in anal cell; venation very similar to *fordi*, posterior fork distinctly narrower than in *mahensis*.

Holotype male and paratype one female, BELGIAN CONGO: Kisantu, 1937 (*de Wulf*), both in Musée Royal du Congo Belge.

Metriocnemus mahensis Kieffer

Metriocnemus mahensis Kieffer, 1911, *Trans. Linn. Soc. Lond.* (*Zool.*) **14**, 360.

This species was described from two females closely resembling the female of *M. benoiti*. Thorax more uniformly brown, stripes not separated, though pruinose along lines of dorso-central bristles; squamal hairs absent, macrotrichia leaving well marked bare lines along the veins, but reaching clearly anterior to tip of costa; posterior fork slightly but distinctly wider than in *benoiti*, Cu_1 more sharply bent. In the absence of males it is difficult to be more precise. The bare squama places it in group F of Edwards' classification.

One type female in British Museum, SEYCHELLES: Mahé, Cascade Estate, 800–1,500 ft.

Genus ***CRICOTOPUS*** van der Wulp

Cricotopus van der Wulp, 1874, *Tijdschr. Ent.* **17**, 132; Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 317; Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 200 (in part); Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 130.

Trichocladius Kieffer, 1923, *Ann. Soc. ent. France* **92**, 182 (in part).

Eyes densely pubescent; humeral pits small; dorso-central hairs minute and decumbent, the punctures from which they arise scarcely visible under a binocular microscope; abdomen often with yellow markings, hypopygium and cerci of female often white; hypopygium lacking anal point; tibiae, especially the anterior pair, often with a broad white ring; wings without visible microtrichia; squama fringed.

As defined above (following Edwards, 1929) this is a distinctive and easily defined genus, although the South American genus *Stictocladius* Edwards suggests that *Cricotopus* and *Trichocladius* are not really very widely separated. Goetghebuer and Kieffer seemed not always able to distinguish the two genera and their *Cricotopus* and *Trichocladius* contain a mixture of the two.

Kieffer described six African species in *Trichocladius*. Four of these seem to be *Cricotopus*; one (*T. guineensis*) is unrecognizable, but may be *Cricotopus*; the sixth, *T. albiclava*, has microtrichia on its wings and may belong to neither genus. I have seen the type series of one of his species only.

Goetghebuer described five species (including a variety of the Palaearctic species *bicinctus*) in the genus *Cricotopus*. Two of these, *cereofasciatus* and *dewulfi* belong to *Trichocladius*. I have seen the types of all his species.

I am recognizing 17 African species, seven of them new. They fall into two groups depending on the presence or absence of a white ring on the anterior tibia. In the group with the ring present, three subsidiary groups can be recognized according to the ornamentation of the abdomen, whether it is black with shining rings, or black with yellow rings, or brown and yellow.

KEY TO AFRICAN SPECIES OF *Cricotopus*

1. Anterior tibiae with white ring or white with black apex, or completely white . . 2
   Anterior tibiae uniformly brown, without white markings 13
2. Abdomen either entirely black or black with brilliant steely blue bands . . . 3
   Abdomen with yellow or leaden yellow markings 6

3. Legs mainly yellow, knees black . . . . . *rodriguensis* Edwards
Legs black except for white ring on at least front tibiae 4
4. White ring on front tibia only 5
White rings on front and middle tibiae . . . . . *harrisoni* sp. n.
5. Abdomen black, without shining bands . . . . . *atriclava* Kieffer
Abdomen with steely shining bands . . . . . *kisantuensis* Goetghebuer
6. Abdomen black and yellow or black and leaden yellow; thoracic stripes usually black and fused at least in the male (c.f. *dibalteatus* sp.n.). 7
Abdomen brown and yellow, thoracic stripes brown and separate 11
7. Anterior tibiae white with only the tip black 8
Anterior tibiae white with tip and base black 9
8. Yellow markings on segments 1, 2, 3, 4 . . . . . *pictiventris* Kieffer
Yellow markings on segments 1, 4, 7 . . . . . *tricinctellus* Goetghebuer
9. Yellow markings on both segments 4 and 5 . . . . . *flavozonatus* Freeman
Yellow or leaden markings on segment 4, segment 5 black 10
10. Posterior tibia white with dark tip; anterior tibia with apical black band about twice as long as basal; abdominal bands leaden yellow; thoracic stripes fused *albitibia* Walker
Posterior tibiae brown; anterior tibiae with basal and apical dark markings equal; abdominal bands clear yellow; thoracic stripes brownish black, may be partially separated . . . . . *bizonatus* sp. n.
11. Anterior tibia entirely white; wing of male more or less cuneiform, anal angle not developed; species from Seychelles . . . . . *quadrifasciatus* Kieffer
Anterior tibia with black tip; anal angle right-angled in male 12
12. Abdominal segments 5–9 brown; all tibiae white with dark tips . . *sudanicus* sp. n.
Abdominal segments 6 and 7 mainly yellow; only anterior tibia white with dark tip . . . . . *meilloni* sp. n.
13. Abdomen with leaden or yellow markings 14
Abdomen without any markings 15
14. Abdomen with segments 1, 4 and 7 yellow . . . . . *verbekei* sp. n.
Abdomen with leaden markings on segments 1, 2 and 5 . . *dibalteatus* sp. n.
15. Male coxite lobe obtuse, practically absent, costa distinctly produced . . *scottae* sp. n.
Male coxite lobe more pronounced, costa hardly produced 16
16. Male coxite lobe as in Text-fig. 4, *h* . . . . . *obscurus* Freeman
Male coxite lobe as in Text-fig. 4, *i* . . . . . *bergensis* Freeman

Cricotopus kisantuensis Goetghebuer

Cricotopus kisantuensis Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 200.
Cricotopus fulgens Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 130 (SYN. NOV.)

Black, thorax with steely blue sheen, abdomen with similar coloured bands on segments 1–4 and 6–9; only the anterior tibiae with a white ring, tarsi yellow, cerci of female yellow, male hypopygium black.

Goetghebuer inferred in his original description of this species that the tarsi were black and that abdominal segments 8–9 had no shining bands. Examination of the type shows that the tarsi are yellowish and that bands are present on the apical segments of the abdomen; my species therefore falls as a synonym.

Male. Wing length 2·0–2·2 mm.

Head dark, face paler, mouthparts brown, antennae and plumes dark, A.R. about 1·0. *Thorax* entirely black and shining with steely blue sheen, except for the scutellum

which is matt black. *Legs* black, tarsi and trochanters yellow, anterior tibia with a white ring placed so that about the basal and apical thirds are black; pulvilli practically absent, L.R. about 0·6. *Wings* with brown veins, cross-vein rather thick, costa slightly produced, anal lobe not produced, squama fringed. Halteres black. *Abdomen* black with steely blue shining bands as follows: segment 1 wholly shining, 2 shining on basal third, 3 shining on basal half to two-thirds, 4 completely shining, 5 completely matt black, 6 and 7 shining on basal halves, 8 and 9 with basal shining bands. Hypopygium black, with straight and rigid inner coxite lobe (Text-fig. 4, *a*), style lacking inner flange.

Female. Wing length 1·75–2·0 mm.

Very similar to male, wing veins seamed with brown, cerci bright yellow.

Holotype of *kisantuensis* in Musée Royal du Congo Belge, of *fulgens* in British Museum.

DISTRIBUTION: GOLD COAST: 3 ♀, Senchi, 1951 (*M. H. Hughes*). BELGIAN CONGO: 1 ♂, Kisantu, iii.1931 (*de Wulf*) (holotype of *kisantuensis*); 1 ♂, Elisabethville, ii.1939 and 1 ♂, iii.1939 (*H. J. Brédo*). CAPE PROVINCE: 1 ♀, Berg River, Wellington, v.1952 (holotype of *fulgens*); 1 ♂, 1 ♀, Krom River, Stellenbosch, xii.52–i.53, 1 ♂, Berg, River, French Hoek, xii.1952 (all coll. *K. M. F. Scott*).

Cricotopus atriclava Kieffer

Trichocladius atriclava Kieffer, 1923, *Ann. Soc. ent. France* **92**, 182.

This might well be an earlier description of *C. kisantuensis* Goetghebuer, but I have seen no type material and as no mention is made of shining bands it is not possible to be certain. The material described by Kieffer was in spirit, a medium which obscures pattern caused by polished or matt surfaces. Other main points of difference between the two species are the mention of pale halteres in the female (again possibly due to the preservation in spirit) and the figure of the male hypopygium. This is only roughly drawn perhaps from a poor mount, but suggests a resemblance to *rodriguensis*. Leg and body colour similar to *kisantuensis*, female cerci yellow.

Type series probably lost. Known only from the type locality, FRENCH CAMEROONS: Kribi.

Cricotopus harrisoni sp. n.

This species is very closely allied to *kisantuensis* and resembles it in colour in every respect except that there is a white ring on the middle as well as on the front tibia. Structurally the two species are similar except for the male hypopygium, the inner coxite lobes being quite different and the styles of *harrisoni* having an inner flange (Text-fig. 4, *b*).

Holotype male, KENYA, Aberdare Range, NYERI Track, 10,500–11,000 ft., 28.x.34 (*J. Ford*) in British Museum. Paratypes, TRANSVAAL: 2 ♂, Lydenburg District, Santa River, iv.1955 (*A. D. Harrison*). NATAL: 1 ♀, Mooi River, nr. Rosetta, ix.1953 (*A. D. Harrison*); 1 ♂, Mooi River, Keate's Drift, x.1954 (*W. D. Oliff*).

Cricotopus rodriguensis Edwards

Cricotopus rodriguensis Edwards, 1923, *Ann. Mag. nat. Hist.* (9) **12**, 332.

Resembles *kisantuensis* and *harrisoni* in appearance, but easily distinguished by the yellowish legs and black knees and by the pale halteres.

Male. Wing length 1·8 mm.

Head, antennae, mouthparts brownish black, face paler, A.R. 1·0. *Thorax* shining black, scutellum matt black. *Legs :* posterior two pairs yellow darkened at the knees and at the tips of the tibiae ; front pair with femora yellow, broadly dark at the apex, tibiae dark with white ring as in *kisantuensis*, tarsi dark ; white ring indicated but not conspicuous on middle tibiae ; L.R. 0·6, small pulvilli just discernible. *Wings* similar to *kisantuensis* ; halteres yellow. *Abdomen* black, with steely blue bands on segments 1–4 as in *kisantuensis*, segments 5, 6, 8 matt black, segment 7 mostly shining. Hypopygium (Text-fig. 4, *c*) with apical half of coxites and styles whitish, inner coxite lobe directed apically, style with sinuous inner margin and in the type two apical spines, a character which may not be constant.

Female similar to male, cerci yellow.

The original description was made from 3 ♂, and 11 ♀, all of which were cited as cotypes. There is one male and four females in the British Museum, I now select this male as lectotype and have marked it accordingly.

DISTRIBUTION : Known only from the type series : RODRIGUEZ I., viii–xi.1918 (*Snell and Thomasset*).

Cricotopus albitibia Walker

Chironomus albitibia Walker, 1848, *List. Dipt. Brit. Mus.* **1**, 16.
? *Trichocladius kribiensis* Kieffer, 1923, *Ann. Soc. ent. France* **92**, 184.
Cricotopus bicinctus var. *plumbeus* Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 201 (SYN. NOV.)

Walker's type is a small male with almost entirely white tibiae to which darker apices can just be distinguished although the specimen is considerably faded. The female from Nigeria mentioned below certainly belongs here as do Goetghebuer's specimens. The South African specimens, however, are larger and darker with broader dark apices to the tibiae, but their general similarity is such that I have no hesitation in placing all in the same species. *T. kribiensis* is almost certainly a synonym, but as no mention is made of abdominal markings, possibly because the material was preserved in spirit, I am leaving the synonymy as a query.

Although this species shows considerable resemblance to the Palaearctic species *bicinctus* Meigen the male styles are broader, the coxite lobe more pointed and the shoulders darker. I think it is more satisfactory to treat it as a distinct species. It can be separated from other African species with black thorax and white tibial rings by the presence of leaden rings on segments 1 and 4 of the abdomen. It is best separated from *bizonatus* by the pale posterior tibiae.

Male. Wing length 1·3–2·8 mm.

Head and antennae black, A.R. 1·0. *Thorax* shining black, shoulders hardly paler, upper half of pleura brownish, scutellum slightly shining. *Legs* : trochanters yellow, femora black, extreme base paler ; tibiae white, tips and bases narrowly

black, apical black band about twice as wide as basal one ; anterior tibiae of S. African specimens with apical half or third black ; anterior tarsi black, others browner ; L.R. about 0·7 ; pulvilli probably absent. *Wings* with normal venation, costa slightly produced ; halteres yellow. *Abdomen* black, segment 1, base of 2 and whole of 4 leaden yellow ; hypopygium yellow, coxites with pointed inner lobe, styles rather stout (Text-fig. 4, *d*).

Female. Similar to male, but thorax often rather paler, so that the mesonotal stripes can just be distinguished ; shoulders and upper parts of pleura yellowish, cerci white.

Holotype of *albitibia*, a male, in the British Museum ; male cotypes of *plumbeus* in Musée Royal du Congo Belge ; the type of *kribiensis* is probably lost (locality French Cameroons, Kribi).

DISTRIBUTION. SIERRA LEONE : 1 ♂ (type of *albitibia*). NIGERIA : 1 ♀, Minna, xii.1954 (*R. W. Crosskey*). ABYSSINIA : 1 ♀, Waldia, i.1936 (*J. W. S. Macfie*). UGANDA : 2 ♀, Jinja, x.1954 (*P. S. Corbet*). BELGIAN CONGO : Katana, Kivu (type series of *plumbeus*) ; 13 ♂, Goma, Kivu, xii.1952 (*J. Verbeke*). NATAL : 1 ♂, Estcourt, ix.1953 (*A. D. Harrison*). CAPE PROVINCE : series of both sexes, Berg River (*K. M. F. Scott*).

Cricotopus bizonatus sp. n.

Abdomen with segments 1 and 4 yellow, hypopygium white ; shoulders yellow anterior tibiae with dark tip and base equal in length, posterior tibiae brown pulvilli absent, male styles narrower than in *albitibia* and coxite lobe blunt.

Male. Wing length 2·5 mm.

Head yellow, palpi rather darker, antennae brown, A.R. 1·0. *Thorax* shining, mesonotal stripes more or less fused and dark brown or black ; shoulders, prothorax and upper parts of pleura yellow, remainder dark brown ; scutellum dull. *Legs* with trochanters and bases of femora yellow, remainder of femora dark brown ; anterior tibia with a centrally placed white ring about half as long as tibia, base and apex with equal blackish bands, anterior tarsi black ; middle tibia with a white ring but basal dark band shorter than apical one, tarsi brown ; posterior tibia brown and without white ring, apex rather darker, tarsi brown ; pulvilli absent. *Wings* normal, anal lobe moderate, squama fringed. Halteres yellow. *Abdomen* very dark brown, the whole of segments 1 and 4 and the base of 2 yellow, hypopygium white, styles curved and of even width, inner coxite lobe blunt (Text-fig. 4, *e*).

Female resembles male ; thoracic stripes rather more definitely separated.

Holotype male, NATAL : Weenen, vi.1925 (*H. P. Thomassett*) in British Museum. Paratypes, NATAL : 2 ♂, Mooi River, Keate's Drift, vii–viii.1954 (*W. D. Oliff*). TRANSVAAL : 1 ♀, Witpoortjie Falls, nr. Johannesburg, xi.1954 (*A. D. Harrison*).

Cricotopus flavozonatus Freeman

Cricotopus flavozonatus Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 131.

Distinguished from other African species by the presence of yellow bands on segments 1, 2, 4, and 5 of abdomen.

Male. Wing length 2·3–2·5 mm.

Head blackish, face pale, mouthparts black, antennae black, A.R. about 1·0. *Thorax* shining ; mesonotum mainly blackish or pitchy, the stripes fused though they can just be distinguished by their slightly darker colour ; prothorax, shoulders and mesonotal margins yellow ; pleura, scutellum and postnotum black. *Legs* mainly brown, bases of all femora and anterior coxae yellow ; anterior tibia with basal fifth blackish, followed by a pure white ring about one-third length of tibia, remainder dark brown ; middle tibia similar, but not so clearly defined ; posterior tibia with only a trace of a paler ring ; all tarsi brown, L.R. about 0·7, pulvilli absent. *Wings* not distinctly milky, anal lobe obtuse, squama fringed, halteres whitish. *Abdomen* black with yellow basal bands on segments 1, 2, 4 and 5, claspers yellow ; yellow bands progressively wider, those at base occupy little more than one-third of segment, that on fifth occupies nearly two-thirds. Hypopygium as in Text-fig. 4, *f*, coxite with small process, style with inner membranous extension.

Female resembles male but pale abdominal markings and leg rings may be less distinct, cerci yellow. Legs usually as in male but the paratype female has the markings obscured, although they can still be just distinguished.

Holotype male in British Museum.

Distribution : Uganda : 1 ♂, Ruwenzori Range, Kilembe, 4,500 ft., xii.34–i.35 (*F. W. Edwards*). Natal : 1 ♂, Weenen, vi.1925 (*H. P. Thomassett*). Cape Province: series of both sexes, including holotype and paratypes, from Berg River, iv–vi and x–xii 1952 and 1953 (*K. M. F. Scott*).

Cricotopus tricinctellus Goetghebuer

Cricotopus tricinctellus Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 201.

Distinguished from the preceding species by the yellow bands being on segments 1, 4 and 7, also the tibiae are white with dark tips only ; similar to *verbekei* sp. n., but distinguished by white tibiae.

Goetghebuer described this species from two males. I have seen the only one of these that is left, in Musée Royal du Congo Belge and it is lacking the abdomen and four posterior legs. The following description is based partly on that specimen and partly on Goetghebuer's original description.

Male. Wing length 1·3 mm.

Antennal ratio 1·0. *Thorax* shining, dark brown, stripes just distinguishable (Goetghebuer says that the background is yellow.) *Legs* with femora yellow, browner apically, all tibiae white with only extreme apices blackish, tarsi brown, L.R. 0·7, small pulvilli present. *Wings* normal, costa slightly produced ; halteres whitish. *Abdomen* black with segments 1, 4, 7 entirely yellow, hypopygium white, coxite without inner lobe.

Female not known.

Type locality, Belgian Congo, Kisantu, iv.1931 (*de Wulf*).

Cricotopus sudanicus sp. n.

Thorax yellowish with dark brown separate stripes, abdomen brown with yellow bands on segments 1–4, all tibiae white with black tips, male hypopygium white,

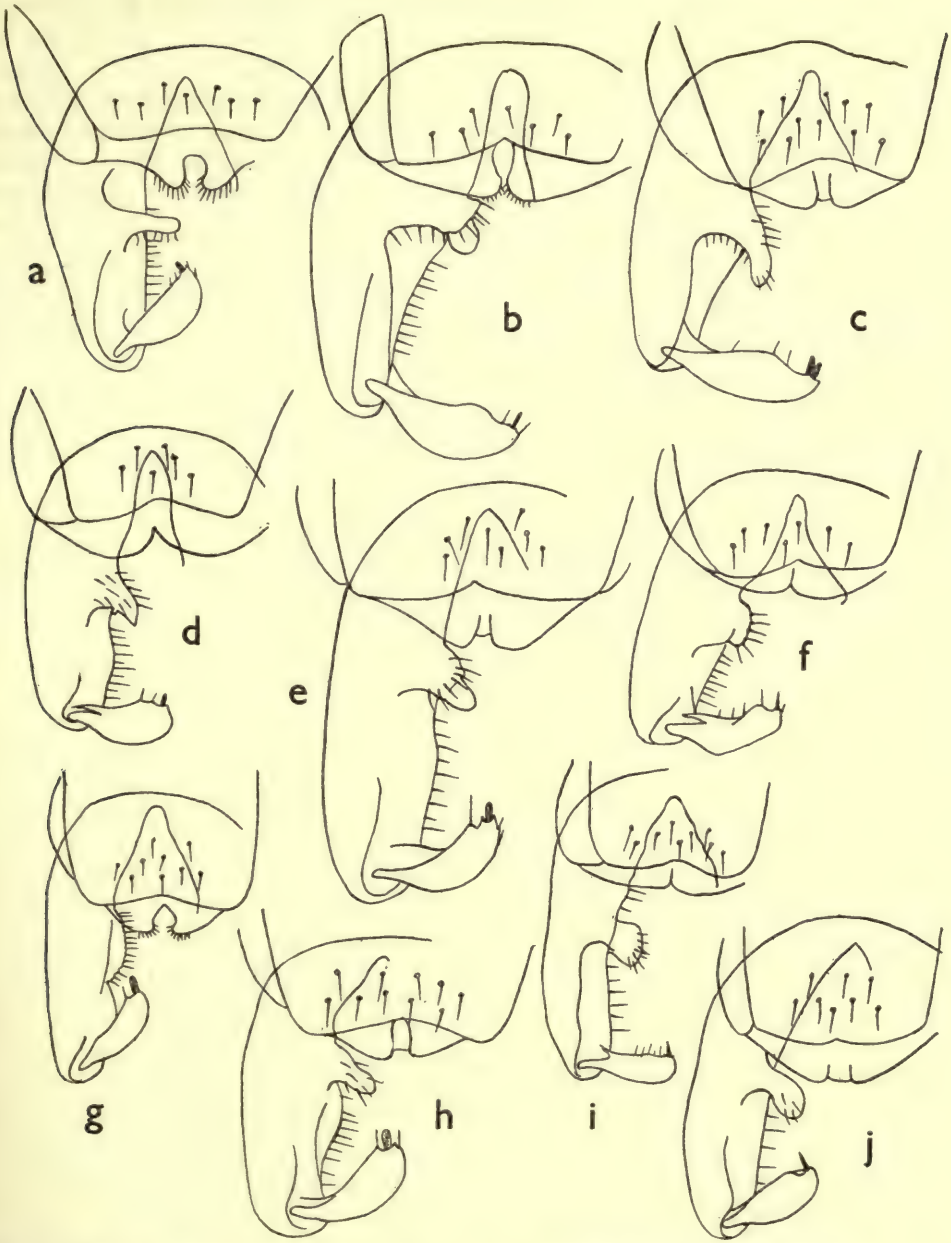

FIG. 4. Male hypopygia of *Cricotopus*. (*a*) *C. kisantuensis*; (*b*) *C. harrisoni*; (*c*) *C. rodriguensis*; (*d*) *C. albitibia*; (*e*) *C. bizonatus*; (*f*) *C. flavozonatus*; (*g*) *C. quadrifasciatus*; (*h*) *C. obscurus*; (*i*) *C. bergensis*; (*j*) *C. dibalteatus*.

in structure very similar to *C. albitibia*. The description of *C. pictiventris* (see below) shows some similarity, but the posterior leg has the apical third dark and the thorax is uniformly brown black.

Male. Wing length 1·2 mm.

Head, mouthparts, antennae and plumes brown, A.R. about 0·9. *Thorax* yellowish brown and shining; stripes and postnotum dark brown, stripes separate, middle one not always very distinct. *Legs* with yellowish brown femora darkened towards the apex; tibiae white, tips only blackish; tarsi yellowish brown, pulvilli absent; L.R. 0·6. *Wings* with normal venation, anal angle right-angled; halteres yellow. *Abdomen* brown and yellow; segment 1 yellow; 2 and 3 yellow on basal half or two-thirds, brown apically; 4 entirely yellow, 5–9 brown, 8–9 darker than 5–7; hypopygium white, structure very similar to that of *albitibia* (Text-fig. 4, *d*) except that style narrower and apical spine thicker.

Female not known.

Holotype male, SUDAN, Wad Medani, ii.1952 (*D. J. Lewis*) in British Museum. Paratypes, 3 ♂, same data as type; 1 ♂, Khartoum, iv.1951 (*D. J. Lewis*), all in British Museum.

Cricotopus pictiventris Kieffer

Trichocladius pictiventris Kieffer, 1923, *Ann. Soc. ent. France* **92**, 184.

I have seen no specimens of this species, which was described from three males. The following description is taken from the original.

Male. Length 2·5 mm.

Colour brown-black, thorax apparently uniformly black; trochanters and bases of femora whitish, anterior and middle tibiae pure white save for the extremities, posterior tibia white on basal third, posterior tarsi sometimes white, pulvilli short. Abdomen black and yellow; segment 1 largely yellow, posterior border black; segment 2 with anterior half yellow and posterior half black; 3 with anterior border yellow and posteriorly with a large black spot; 4 entirely yellow; 5–9 black; hypopygium pure white.

Holotype probably lost.

DISTRIBUTION: known only from the type series from FRENCH CAMEROONS, Kribi.

Cricotopus quadrifasciatus Kieffer

Trichocladius quadrifasciatus Kieffer, 1911, *Trans. Linn. Soc. Lond.* (2) *Zool.* **14**, 360.

Brown and yellow, scutal stripes separate, anterior tibiae entirely white, abdomen yellow with brown bands on segments 2, 3, 5 and 8, anal area of wings reduced.

Male. Wing length 1·25 mm.

Head, antennae and mouthparts brownish yellow, A.R. about 1·0. *Thorax* shining yellowish brown with darker brown stripes, postnotum and sometimes sternopleuron; stripes separate. *Legs* yellowish brown, anterior tibiae completely white, middle tibiae white, narrowly brown basally, more broadly so at apex. posterior tibiae yellowish brown; L.R. 0·65. *Wings* unmarked, anal area reduced, almost

cuneiform, venation normal, halteres yellow. *Abdomen* mainly yellow and with brown bands occupying posterior halves of segments 2–3, most of 5 and 8 ; segment 6 sometimes with a dark apical band. Hypopygium white, inner coxite lobe reduced (Text-fig. 4, *g*).

Female. Very similar to male, abdomen with larger brown bands, cerci yellow.

Type series in the British Museum.

DISTRIBUTION : Known only from the type series, SEYCHELLES : Mahé.

Cricotopus meilloni sp. n.

Distinguished from *C. 4-fasciatus* by the absence of white markings on the middle tibiae, by the presence of a dark tip to the anterior tibia and by the better developed anal area to the wing. Distinguished from *C. sudanicus* by the yellow markings on segments 7–8 and by the absence of white markings on the middle tibiae.

Male. Wing length 1·3 mm.

Head, antennae and mouthparts brown, A.R. about 1·0. *Thorax* yellowish with brown separate scutal stripes ; postnotum brown. *Legs* yellowish brown except for anterior tibiae which are white with apical quarter darkened ; small pulvilli probably present, anterior tarsi missing in the type. *Wings* with a distinct brownish tinge, venation normal, anal area larger than in *4-fasciatus*, halteres whitish. *Abdomen* yellow with brown bands ; segments 2–3 brown on apical halves, 5 entirely brown, 6 brown apically, 8 entirely brown, remainder and hypopygium yellow. Hypopygium with coxite lobe rather like that of *albitibia* (Text-fig. 4, *d*) but style narrower and longer.

Female not known.

Holotype male, TRANSVAAL : Tzaneen, ii.1932 (*B. de Meillon*) in British Museum.

Cricotopus obscurus Freeman

Cricotopus obscurus Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 131.

A dark species without abdominal or leg markings, separable from the following species by the structure of the male hypopygium and by the larger size.

Male. Wing length 2·0 mm.

Head black, mouthparts, antennae and plumes black, A.R. about 1·0. *Thorax* shining but not brilliant, stripes black on a brown or yellowish background, shoulders and lateral margins more yellowish ; pleura yellowish above, black below ; scutellum brown, postnotum black. *Legs* uniformly pale brown, L.R. 0·6, pulvilli absent. *Wings* slightly milky, costa hardly produced, anal lobe right-angled. Halteres with dark stems and brownish knobs. *Abdomen* uniformly blackish ; hypopygium black, coxite with inner thumb-like process (Text-fig. 4, *h*), style without inner flange.

Female very similar to male in colouring, femora slightly darker than the rest of the legs.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE : Berg River, series of both sexes from Wellington (type locality), Ceres, Hermanus Falls, French Hoek (*K. M. F. Scott*). NATAL : Tugela and Mooi Rivers, series of both sexes, ix.1953 (*A. D. Harrison*).

Cricotopus bergensis Freeman

Cricotopus angustus Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 132 *nec* Goetghebuer, 1927, *Ann. Bull. Soc. ent. Belge* **67**, 52.
Cricotopus bergensis Freeman, 1954, Proc. R. ent. Soc. Lond. (B) **23**, 173, *nom. nov. pro. angustus.*

Very similar to *obscurus* but rather smaller and differing in the male hypopygium.

Male. Wing length 1·4 mm.

Head yellowish brown, mouthparts black, A.R. about 1·0. *Thorax* with three dark brown stripes on a yellowish ground colour, scutellum yellowish, postnotum and sternopleuron dark brown; whole thorax slightly pruinose, not so markedly yellow as in *obscurus*. *Legs* brown, L.R. about 0·6, pulvilli absent. *Wings* similar to *obscurus*, anal lobe perhaps more obtuse. Halteres rather paler. *Abdomen* uniformly blackish; hypopygium (Text-fig. 4, *i*) with narrow coxite with well developed inner process of a different shape from that of *obscurus*, style broader and lacking inner flange.

Female resembles male, cerci dark.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE: type series of 2 ♂, Berg River, Piquetberg, x–xi.52 (*K. M. F. Scott*). NATAL: 1 ♂, 3 ♀, Natal National Park v.1954 (*W. D. Oliff*). ABYSSINIA: 3 ♂, 1 ♀, Waldia, i.1936 (*J. W. S. Macfie*).

Cricotopus scottae sp. n.

Indistinguishable in colour from *obscurus*. Structurally differs in the male hypopygium which is almost as in *quadrifasciatus* (Text-fig. 4, *g*), the inner coxite lobe being obtuse, also the costa is distinctly produced.

Holotype male, CAPE PROVINCE, Berg River, Wellington, 28.iv.51 (*K. M. F. Scott*) in British Museum. Paratypes—CAPE PROVINCE; 1 ♂, Piquetberg, 25.ix.52 (*K. M. F. Scott*). NATAL: 1 ♂, Tugela River, Oliviershoek Bridge, viii.1954 (*A. D. Harrison*). TRANSVAAL: 7 ♂, 2 ♀, Johannesburg, Olifantsvlei, v–viii.1954 and 1 ♂, III 1955 and 4 ♂, 2 ♀, Gt. Usutu River, nr. Amsterdam, ix.1954 (*A. D. Harrison*). S. RHODESIA: 4 ♂, Salisbury, ix–x.1954 (*E. T. M. Reid*). BELGIAN CONGO: 16 ♂, 12 ♀, Vitshumbi (S. Lake Edward) i.1953 (*J. Verbeke*).

Cricotopus dibalteatus sp. n.

Tibiae without white markings, thoracic stripes separate, abdomen with two leaden yellow bands, one occupying the whole of segments 1 and 2, the other on 5, hypopygium pale, coxite lobe well developed.

Male. Wing length 1·25 mm.

Head brown, mouthparts and antennae darker, A.R. 0·6. *Thorax* with brownish yellow background, scutal stripes blackish, shining and separate, middle one divided longitudinally; scutellum matt black, postnotum and sternopleuron dark brown. *Legs* uniformly yellowish brown, pulvilli absent, L.R. 0·75. *Wings* with a distinct brownish tinge, venation normal, costa hardly produced, anal area moderate,

halteres yellow. *Abdomen* blackish, segments 1, 2, 5 completely leaden yellow, incisures and hypopygium paler. Hypopygium (Text-fig. 4, *j*) with well formed and slightly capitate coxite lobe, style normal, apical spine fairly long.

Female resembles male, cerci pale.

Holotype male and 1 ♂, 1 ♀ paratypes, CAPE PROVINCE: Platteklip Gorge, 27.i.53 (*K. M. F. Scott*) all in British Museum. *Transvaal:* 1 ♂, Lydenburg Dist., iv.1955 (*A. D. Harrison*).

A second male from Transvaal has distinct white rings on the anterior tibiae which may be the normal condition, those with the plain tibiae being teneral.

Cricotopus verbekei sp. n.

Legs without white rings; thoracic stripes brown, more or less separated, abdomen with segments 1, 4 and 7 yellow.

At first sight this species appears to resemble *tricinctellus* but it is easily distinguished by the absence of white rings on the tibiae.

Male. Wing length 1·2–3 mm.

Head yellowish brown, palpi darker, antennae dark brown, A.R. 0·9, eyes densely pubescent. *Thorax* brown or dark brown, shining; shoulders, wing-bases, pleural membrane and prothorax yellowish; mesonotal stripes more or less separated by yellow. *Legs* uniformly brown, L.R. 0·7, pulvilli absent, empodium well developed. *Wings* with anal lobe right-angled, costa slightly produced, venation normal, halteres yellow. *Abdomen* dark brown, segments 1, base of 2, 4, 7 and hypopygium yellow; incisure between 2 and 3 also pale. Hypopygium simple, coxite without inner lobe, style with no flange, anal point absent as usual.

Female very similar to male; thorax more yellow, stripes well separated, cerci yellow.

Holotype male and paratypes 2 ♂, BELGIAN CONGO: Mbereze, Baie Pili-Pili ii.1953 (*J. Verbeke*) in Institut Royal des Sciences Naturelles de Belgique. Paratypes in British Museum, SUDAN: 10 ♂, 12 ♀, Wau, x.1952 and 1 ♀, Amadi, vi–vii.1954 (*E. T. M. Reid*). NIGERIA: 2 ♀, Alzaga, i.1955 (*R. W. Crosskey*).

Genus ***TRICHOCLADIUS*** Kieffer

Trichocladius Kieffer, 1906, *Mem. Soc. Sci. Brux.* **30**, 356; ? Kieffer, 1923, *Ann. Soc. ent. France* **92**, 182 (in part); Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 328 (as subgenus of *Spaniotoma*).
Dactylocladius Kieffer, 1918, *Ann. Mus. nat. Hung.* **16**, 81 (in part) (not Kieffer, 1906, *Mem. Soc. Sci. Brux.* **30**, 356).
Cricotopus Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 200 (in part).
Eukiefferiella Goetghebuer, 1934, *Ibid.* **25**, 204 (not Thienemann, 1926, *Arch. Hydrobiol.* **17**, 325).

Eyes pubescent; scutum usually shining, dorso-central bristles large and erect, humeral pits unusually large in most species; wing membrane without macrotrichia or distinguishable microtrichia, squama with complete fringe, R_{2+3} ending near mid-way between R_1 and R_{4+5}.

I am following Edwards (1929) in his use of the name *Trichocladius* for the hairy-eyed species with erect dorso-central bristles and large humeral pits. However, I

prefer to consider the group of generic rather than subgeneric level, as explained in the introduction to the subfamily.

As mentioned under *Cricotopus*, four of the African species described by Kieffer in *Trichocladius* seem to belong to *Cricotopus* as used here. Two only, *T. albiclava* Kieffer 1923, and *guineensis* Kieffer 1918, may not be *Cricotopus*. The true genus of *albiclava* is in some doubt because Kieffer omits mention of the pubescent eyes, though he mentions this character for all other species; it is probably neither *Cricotopus* nor *Trichocladius*. *T. guineensis* was described from a female and is unrecognizable; the type is lost. Brief diagnoses from the original descriptions are given below.

Three species described by Goetghebuer in 1934, two in *Cricotopus* and one in *Eukiefferiella* should be placed in *Trichocladius*.

KEY TO AFRICAN SPECIES OF *Trichocladius*

(*T. albiclava* and *guineensis* not included)

1. Pulvilli absent, anal point absent, humeral pits small or not distinct . . . 2
   Pulvilli present, anal point present, humeral pits large and distinct . . . 3
2. Prothorax with brilliant silvery pruinosity in both sexes, mesonotal stripes fused in male . . . . . *micans* Kieffer
   Prothorax without silvery pruinosity, mesonotal stripes separate in male (female not known) . . . . . *pretorianus* sp. n.
3. Segment 1 and often 6–8 of male abdomen yellow, female unknown *cereofasciatus* Goetghebuer
   Abdomen entirely black, at least dorsally 4
4. Small species, wing length 1·0 mm.; thorax with strong bluish metallic sheen; costa distinctly produced . . . . . *metallescens* Goetghebuer
   Larger species, wing length 1·7–2·0 mm.; thorax shining but metallic sheen either absent or only present when viewed from certain angles and then slight; costa hardly produced . . . . . *capensis* Freeman

Trichocladius micans Kieffer

Dactylocladius micans Kieffer, 1918, *Ann. Mus. nat. Hung.* **16**, 81.
Cricotopus dewulfi Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 201 (SYN. NOV.).
Trichocladius micans Freeman, 1955, *South African Animal Life.* Uppsala. **2**, 251.

Although the absence of pulvilli and anal point place this species in Edwards' Group A, the humeral pits are larger than usual though not as large as those of *capensis*. It is easily separated from the other African species by the strikingly silvery prothorax in both sexes, a character not mentioned by either Kieffer or Goetghebuer.

Male. Wing length 1·5–1·8 mm.

Head, mouthparts and antennae dark, eyes pubescent, A.R. about 1·0. *Thorax* shining black, stripes fused, shoulders yellowish, prothorax yellowish and with distinctive silvery priunosity, humeral pits not as large as in *capensis*, but larger than is usual in the subfamily; dorso-central hairs well developed. *Legs:* femora with basal half yellowish and apical half dark, anterior tibiae and tarsi black, other tibiae brownish, tarsi blackish, L.R. 0·6; pulvilli absent, empodium well developed.

Wings with anal lobe slightly produced, halteres yellow. *Abdomen* black and with black hairs. Hypopygium (Text-fig. 5, *a*) without anal point, otherwise very similar to *capensis*, styles sometimes yellow.

Female, similar to male, antennae with 7 segments, thorax with stripes more or less fused, prothorax silvery, humeral pits smaller than in *capensis*, cerci may be yellow.

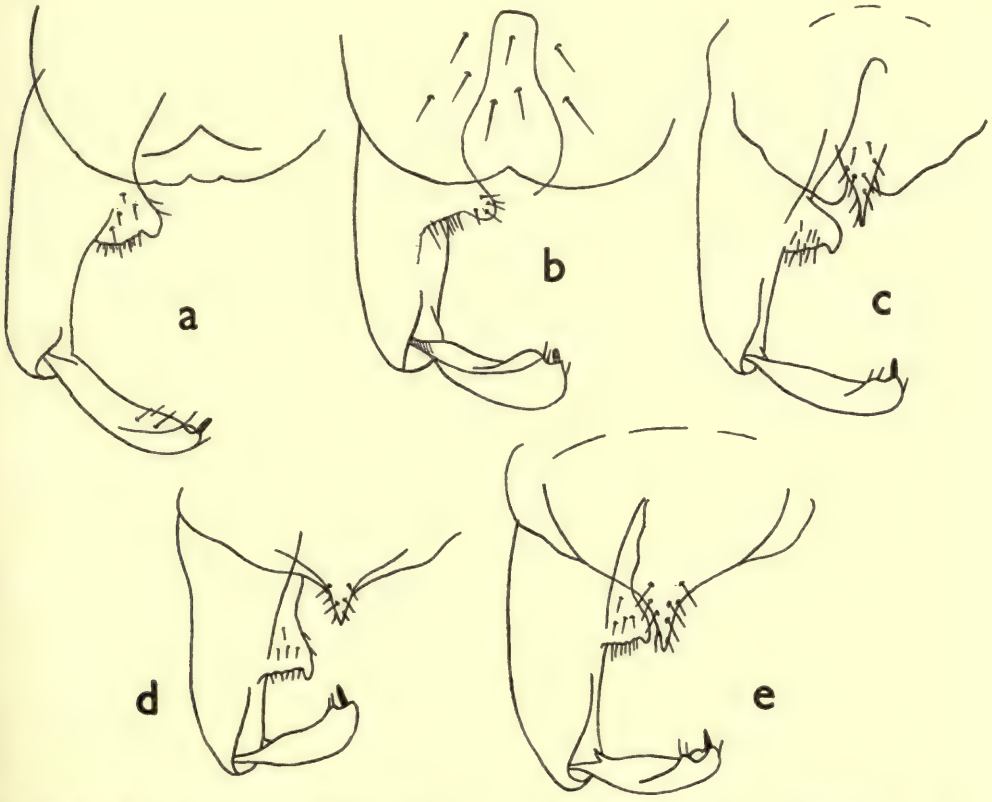

FIG. 5. Male hypopygia of *Trichocladius*. (*a*) *T. micans*; (*b*) *T. pretorianus*; (*c*) *T. capensis*; (*d*) *T. metallescens*; (*e*) *T. cereofasciatus*.

I have seen a cotype male, borrowed from the Hungarian National Museum, also the type series of *Cricotopus dewulfi* in Musée Royal du Congo Belge.

DISTRIBUTION. CAPE PROVINCE: 1 ♂, Port St. John, v.1924 (*R. E. Turner*); 1 ♂, 1 ♀, Outshorn, x.1931 (*A. Mackie*); 2 ♂, 2 ♀, Hout Bay, ii.1951 (*P. Brinck*). NATAL: 27 ♂, 10 ♀, Tugela River, Mooi River, Bushman's River, ix.1953 (*A. D. Harrison*); 1 ♂ cotype, New Hanover; 4 ♂, 3 ♀, Weenen, xii.23, iv–v.24, vi.25 (*H. P. Thomasset*). TRANSVAAL: 1 ♂ cotype, Pretoria; 2 ♂, Pretoria, 1954 (*G. Rudebeck*); 2 ♂, 1 ♀, Nelspruit, x.1954 (*A. D. Harrison*). BELGIAN CONGO: type series of *dewulfi*, Kisantu, iv.1931 (*de Wulf*). UGANDA: 3 ♀, L. Victoria (*W. W.*

Macdonald). ABYSSINIA : 1 ♂, 1 ♀, Dessie, xii.35–i.36 (*J. W. S. Macfie*). YEMEN : 2 ♂, San'a, 7,900 ft., ix.37–i.38 (*C. Rathjens*).

Trichocladius pretorianus sp. n.

Mesonotal stripes black, clearly separated, background yellow ; humeral pits not very distinct, prothorax not silvery ; pulvilli absent ; anal point absent. It falls into Edwards' Group A.

Male. Wing length 1·8 mm.

Head, mouthparts and antennae blackish brown, face pale ; eyes densely pubescent; A.R. about 1·2. *Thorax* mainly black but with yellow background colour on shoulders, along lines of dorso-central bristles, along lateral margins of mesonotum and upper parts of pleura ; stripes clearly separated, middle one extending back to scutellum. Dorso-central bristles erect and their pits clear, humeral pits not very distinct, prothorax not silvery. *Legs* brown, trochanters yellow, L.R. 0·6, pulvilli absent, empodium well developed. *Wings* with normal venation, costa not produced, anal lobe slightly poduced, halteres yellow. *Abdomen* black. Hypopygium (Text-fig. 5, *b*) without anal point, coxite with inner lobe, style with strongly developed flange.

Female not known.

Holotype male, TRANSVAAL : Pretoria, 16.vi.54 (*A. D. Harrison*), in the British Museum.

? *Trichocladius albiclava* Kieffer

Trichocladius albiclava Kieffer, 1923, *Ann. Soc. ent. France* **92**, 183.

As explained above, this species is placed here in some doubt. The type is lost and the characters given by Kieffer are not sufficient for placing it accurately in a genus. No mention is made of the hairiness or otherwise of the eyes.

Male. Length 2·3 mm.

Brown black, palpi whitish, very long. Antennae brown, segments 5–13 twice as long as broad, A.R. 1·5. Halteres white, wings finely punctate, veins brownish, costa produced for a distance equal to length of r–m ; R_{4+5} ending basal to level of apex of M_{3+4}, posterior fork below r–m which is perpendicular. Legs brown, trochanters white, L.R. 0·6, pulvilii absent, empodium as long as claws. Abdomen brownish white, last three segments and hypopygium brown. Judging by Kieffer's figure, hypopygium not unlike *Cricotopus obscurus* (Text-fig. 4, *h*).

Female not known.

Type locality FRENCH CAMEROONS : Kribi.

? *Trichocladius guineensis* Kieffer

Trichocladius guineensis Kieffer, 1918, *Ann. Mus. nat. Hung.* **16**, 84.

This species was described in a paper devoted to the Chironomidae of the Hungarian National Museum, but the type which is lost did not belong to that Museum, having been sent to Kieffer separately by Professor Silvestri.

Female. Length 1·5 mm.

Brown black, ventrally brownish yellow ; palpi brownish ; eyes oval, pubescent ; antennae broken ; wings punctate, veins brown, costa hardly produced, posterior fork well distal to r–m cross-vein ; anterior tarsi broken, empodium equal to the claws.

Type locality, FRENCH GUINEA : Mamon.

Trichocladius capensis Freeman

Trichocladius capensis Freeman, 1953, *Proc. R. ent. Soc. Lond.* **22**, 133.

This is a very typical species of the genus falling into Edwards' (1929) Group B. As stated in the original description there is some variation in colour.

Thorax strongly shining, stripes black, more or less fused in the male, may be separated in the female ; humeral pits very large ; halteres brown ; pulvilli present.

Male. Wing length 1·75–2·0 mm.

Head black, mouthparts black, antennae and plumes black, pedicel pruinose, A.R. about 1·0. *Thorax* brightly shining with three prominent black stripes which are usually more or less fused, the intervening areas being brown rather than black ; humeral pits large and dorso-central bristles well developed, shoulders may be yellow ; scutellum brownish, postnotum black, pleura yellowish, sternopleura black. *Legs* brown, paler at bases of femora, darker on tarsi and at knees, pulvilli well developed, L.R. 0·75. *Wings* unmarked, costa hardly produced, anal lobe not produced, right-angled, squama fringed, halteres with brownish knobs. *Abdomen* black, basal segments sometimes tinged with brown, especially laterally. Hypopygium (Text-fig. 5, *c*) with well developed hairy anal point.

Female. Resembles male in general features, face paler, antennae with 6 segments, ground colour of thorax often yellow and the stripes well separated, but this is not universal and some specimens have stripes more or less fused ; cerci black.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE : holotype and type series of both sexes from Berg River iv–v and xii . 1952, other specimens, vii, x and xi (*K. M. F. Scott*). NATAL : 1 ♀, Scottburgh, vii . 53 (*A. D. Harrison*) ; 1 ♂, 1 ♀, Estcourt, iv . 54 (*W. D. Oliff*). TRANSVAAL : 1 ♀, Nelspruit, ix . 54 (*A. D. Harrison*) ; 1 ♂, Blyde River, ix . 1954 (*A. D. Harrison*). TANGANYIKA : 1 ♂, Amani, iii . 1955 (*M. T. Gillies*).

Trichocladius metallescens Goetghebuer

Eukiefferiella metellescens Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 204.

Goetghebuer seems to have missed the pubescent eyes when he placed this species in *Eukiefferiella*. It is extremely similar to the Palaearctic species *T. chalybeata* Edwards, from which it may be separated by the smaller humeral pits and lower antennal ratio. The male is a small black insect with a strong bluish metallic sheen on the mesonotum. In the female there is more yellow on the thorax and the stripes are partially separated.

Male. Wing length 1·0 mm.

Head brownish black, face yellowish brown, antennae and mouthparts brown, A.R. 0·8, eyes closely covered with short pubescence. *Thorax* entirely black, meso-

notum with a brilliant steely blue sheen, scutellum matt ; humeral pits very distinct, circular and white, but smaller than in *chalybeata*. *Legs* dark brown, L.R. 0·6, small pulvilli present. *Wings* clear, anterior veins brown, posterior ones pale, costa distinctly produced, R_{2+3} normal, anal angle almost a right angle, squama fringed ; halteres dark. *Abdomen* black, sternites paler, hypopygium (Text-fig. 5, *d*) not unlike that of *capensis*, but coxite lobe nearer the apex, anal point shorter and broader, style rather more curved.

Female quite similar to male but thorax partially yellow ; pleura yellowish, shoulders slightly yellow, stripes partially separate.

I have seen the type series in the Musée Royal du Congo Belge.

DISTRIBUTION. BELGIAN CONGO : type series of 5 ♂, Kisantu, iv.1932 (*de Wulf*) ; 1 ♂, Elisabethville iii.1939 (*H. J. Brédo*). SIERRA LEONE : 2 ♀, River Njia, i.1926 (*B. Blacklock*). SUDAN : 1 ♂, Amadi, vi–vii.54 (*E. T. M. Reid*).

Trichocladius cereofasciatus Goetghebeur

Cricotopus cereofasciatus Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 202.

Structurally very similar to capensis, but readily separated by the yellow abdominal bands on segments 1 and 8 or 6–8.

Male. Wing length 1·75 mm.

Head yellowish brown, face paler, antennae and palpi brown, A.R. 1·2, eyes densely pubescent. *Thorax :* mesonotal background yellow, stripes shining, blackish brown and fused or separate, shoulders yellow or orange with large humeral pits, dorso-central bristles clear ; pleura yellow, sternopleuron brown, scutellum matt black, postnotum black. Goetghebuer states that the dorso-central bristles are not erect, but this is incorrect,because they are distinct and erect in both type specimens. *Legs* brown, coxae and trochanters yellowish, L.R. 0·8 (stated by Goetghebuer to be 1·1), pulvilli present. *Wings* with a slight brownish tinge, anal angle obtuse, squama fringed ; halteres yellow. *Abdomen* black, segments 1 and 6–8 rich yellow in type specimens and Rutshuru specimen ; Elisabethville males have 6–7 dark ; hypopygium black (Text-fig. 5, *e*), very similar to *capensis*.

Female not known.

I have seen the type series of two males in the Musée Royal du Congo Belge.

DISTRIBUTION. BELGIAN CONGO : type series of 2 ♂, Kisantu, iii–iv.31 (*de Wulf*) ; 1 ♂, Rutshuru, i.1934 (*de Wulf*) ; 2 ♂, Elizabethville, ii–iv.1939 (*H. J. Brédo*).

Genus ***HARRISONINA*** gen. nov.

Eyes oval, densely pubescent, facets rounded. Antennae short, reduced and without plumes in the male, five-segmented in the female, six-segmented in the male. Male palpi well developed and with four segments, in female short and segmentation obscured. Prothorax collar-like and undivided, anepisternal suture distinct, postnotum rounded and without longitudinal fissure. Wings without macrotrichia, membrane coarsely punctate but microtrichia indistinct, especially in the male, squama bare, wing fringe short ; R_{2+3} simple and well developed, costa produced,

r–m cross-vein long and nearly transverse. Legs rather long, posterior pair the shortest and thickened and with modified basitarsus in the male of the only known species ; pulvilli practically absent, empodium well developed ; tibial spurs present on front and posterior tibiae, absent from middle tibiae ; posterior tibial comb reduced and represented by a patch of bristles. Eighth abdominal segment of female more strongly sclerotized than others, sternite with two short downward projections at apex ; spermathecae three in number, sclerotized and bell-shaped. Male hypopygium of the only known species not inverted, style subapical and with peg-like teeth along it which close inwardly on to a spiny area of the coxite.

Type of the genus *Harrisonina petricola* sp. n.

In general appearance and in such characters as the reduction of the posterior tibial comb, postnotal fissure and male antennae, the only known species of this genus shows some resemblance to species of the subfamily Clunioninae. However, it obviously does not belong there because of the well developed prothorax and anepisternal suture. Although it falls into the subfamily Orthocladiinae on account of the absence of the base of M_4 and by the short anterior basitarsus, its exact affinities are obscure.

The distinctive features separating it from other genera, especially *Abiskomyia* Edwards, are the pubescent eyes, reduced male antennae, absence of mid-tibial spurs, reduction of posterior tibial comb, absence of postnotal fissure, the peculiar male hypopygium and the presence of three bell-shaped spermathecae.

As mentioned in Part I, three spermathecae are present in species of the subfamily Tanypodinae and in *Protanypus* of the Diamesinae, a genus which is intermediate between the two subfamilies. In other genera and subfamilies which I have examined, there are only two spermathecae and it is therefore surprising to find three here.

Harrisonina petricola sp. n.

A small uniformly brown fly with greyish wings ; eyes pubescent, male antennae simple and six-segmented ; dorso-central bristles visible, but not large ; postnotum without fissure ; abdomen clothed with short spine-like hairs ; male posterior basitarsus short and thick ; male styles subapical and with 6–8 capitate spines in a row.

Male. Wing length 1·5 mm.

General coloration dark brown, the stalks of the halteres are pale, but the knobs are dark. *Head :* eyes densely pubescent, palpi four-segmented, the second segment long (Text-fig. 6, *a*), palpifer well formed and may be mistaken for a fifth segment ; antennae (Text-fig. 6, *c*) greatly reduced, six-segmented, with short hair only. *Thorax*: prothorax hairy, complete and collar-like, though narrower in the centre, slightly overhung by the mesonotum ; dorso-central hairs present but short, acrostichals seem to be absent, postnotum without fissure, though a central faint line, can be seen on a cleared specimen. *Legs* rather long but, unlike the Clunioninae, it is the middle pair which are the longest and their tibiae lack apical spurs ; pulvilli only distinguishable in slide mounts, empodium well developed, L.R. 0·7. Posterior legs thickened and short, tibiae with two spurs, comb represented by a group of about

eight bristles, basitarsus short and thickened (Text-fig. 6, *f*), ending obliquely and with a short thick spine each side, the second segment is inserted between the spines and in the middle of the oblique end, second segment subequal to basitarsus. *Wings* (Text-fig. 6, *e*) with anal area cut away to some extent; costa produced, R_{2+3} simple, r–m long and transverse, squama bare. *Abdomen*, especially segments 1–5 clothed with short spine-like setae similar to those of female but much fewer in number. Hypopygium (Text-fig. 6, *g*) quite peculiar; anal point well developed, stout and blunt; coxites rounded apically, styles set subapically on coxites and with 6–8 capitate spines in a row closing on to a spiny area on the inner surface of the coxite.

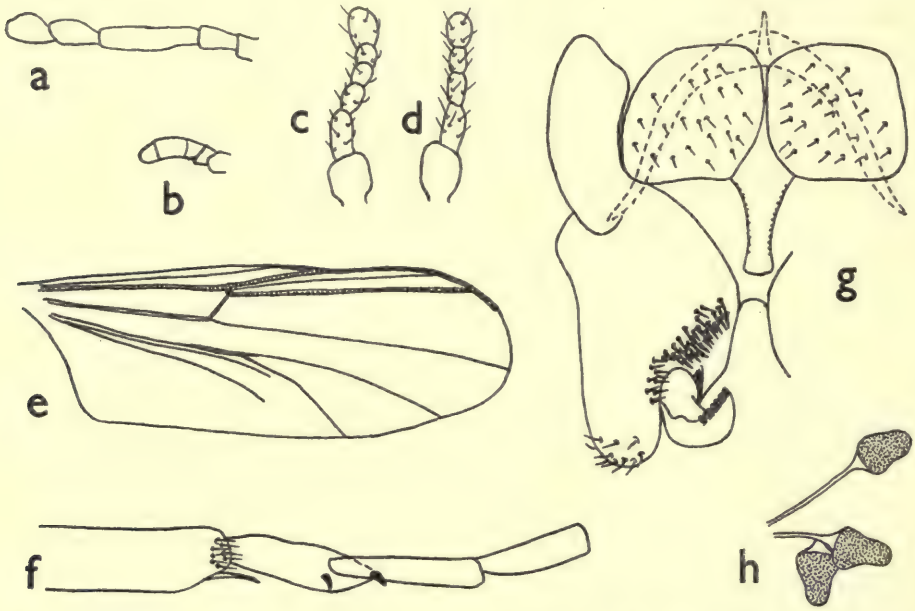

FIG. 6. *Harrisonina petricola*. (*a*) Male palp; (*b*) female palp; (*c*) male antenna; (*d*) female antenna; (*e*) male wing; (*f*) apex of posterior tibia and base of tarsus of male; (*g*) male hypopygium; (*h*) spermathecae.

Female. In size and general appearance similar to male. Antennae only 5-segmented (Text-fig. 6, *d*), hairs short, palpi (Text-fig. 6, *b*) shorter than in male and segmentation indistinct. Posterior legs unmodified, but still the shortest, basitarsus cylindrical and twice as long as second segment. Abdomen thickly clothed on segments 1–7 with short, curved, spine-like setae. Spermathecae (Text-fig. 6, *h*) three in number, and with a slight constriction making them bell-shaped, each has its own duct.

Holotype male and one male and two female paratypes TRANSVAAL: Olifants River Valley, 17.xi.54 (*A. D. Harrison*). Mr. Harrison found this species breeding in the thin film of water running over the stones in a temporary mountain stream. Holotype and one paratype in British Museum, other two paratypes in S. African Museum.

Genus *CARDIOCLADIUS* Kieffer

Cardiocladius Kieffer, 1912, *Spolia zeylanica* **8**, 22, Edwards, 1924, *Ent. mon. Mag.* **60**, 203–7; Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 317.

Eyes bare. Pronotum wide and collar-like, with a median V-shaped emargination. Fourth tarsal segment distinctly cordiform and much shorter than the fifth, empodium small, pulvilli absent, tibial spurs and comb normal. Wings bare, both macrotrichia and microtrichia being absent; anal lobe well developed, squama fringed; R_{2+3} faint at apex and not distinctly reaching costa, well separated from R_1; posterior fork slightly beyond r–m. Ninth tergite of female with a finger-like projection on each side; anal point of male absent, except in the S. American species *C. acuminatus* Edwards.

Most of the species of this genus have heavily dusted thoraces; in the S. American species mentioned above the thorax is shining. Thienemann (1954, *Die Binnengewässer* **20**, 49 and 58) states that the larvae of *Cardiocladius* species live amongst colonies of *Simulium* larvae and pupae on which they feed. All the breeding records known to me are from rivers and streams. No species have been described from Africa by either Kieffer or Goetghebuer.

Key to African Species of *Cardiocladius*

1. Dorso-central bristles uniserial 2
   Dorso-central bristles bi- or triserial 3
2. Legs pale, posterior femora in most specimens yellow with dark tips, male styles incurved (Text-fig. 7, *a*) . . . . . *africanus* Freeman
   Legs dark, pale only at the base, male styles broader (Text-fig. 7, *b*) . . *oliffi* sp. n.
3. Thoracic stripes of male separate, background yellow, yellowish brown species (female not known) . . . . . *hessei* sp. n.
   Stripes of male and female indistinct, background grey, blackish species with grey rings on abdomen . . . . . *latistilus* sp. n.

Cardiocladius africanus Freeman

Cardiocladius africanus Freeman, 1955, *South African Animal Life*. Uppsala, **2**, 249.

Thorax uniformly dusted with grey, abdomen black, legs mainly yellow except for anterior pair, male styles somewhat incurved at apex. This appears to be the most widespread and common species.

Male. Wing length 2·0 mm.

Head dark grey, face yellowish, palpi dark, antennal plumes white, A.R. about 1·3. *Thorax* with black cuticle, shoulders slightly paler, the whole thorax uniformly and heavily grey dusted, except on scutellum and postnotum, mesonotum with a fine median black line; acrostichal bristles absent, dorso-centrals white and uniserial, quite long and present only on posterior two-thirds of mesonotum. *Legs:* anterior pair dark except for basal half of femur which is pale, other legs pale with dark knees, tips of tibiae and tarsal segments; some South African specimens have the posterior four femora mostly dark. *Wings* clear, anal lobe moderate, squama with complete fringe, venation normal, costa not produced; halteres yellow. *Abdomen*

black with white hairs. Hypopygium (Text-fig. 7, *a*) lacking anal point; style rather incurved and with a single spine, not flattened; coxite lobes more or less double, one part conical, the other slightly hooked.

Female. Quite similar to male, but shoulders often more definitely pale, sometimes quite yellow and paleness may extend back along lines of bristles so that stripes are separate, although grey dusting obscures the pattern; prothorax and scutellum yellowish; abdominal segments paler at apices; IXth tergite with lateral processes as usual.

Holotype male in British Museum.

DISTRIBUTION. ETHIOPIA: 1 ♂, 15 ♀, Waldia, i.1936 (*J. W. S. Macfie*)—type series. BELGIAN CONGO: Elisabethville, 3 ♀, ii.1934, 3 ♂, xii.38–ii.39, 2 ♀, ii.1940 (*J. H. Brédo*); 1 ♀, Bambesa, 1937 (*J. Vrydagh*). NATAL: 1 ♀, Estcourt, ii.1951, 1 ♂, Royal Natal National Park, iv.1951, 1 ♀, Albert Falls, Umgeni River, iv.1951 (*Swedish S. African Exp.*).

Cardiocladius oliffi sp. n.

Very similar in general appearance to *C. africanus*, from which it may be separated by the structure of the male hypopygium, by the darker legs and by the shorter antennae.

Male. Wing length 2 mm.

Head dark grey, palpi blackish, antennal plumes whitish, antennae rather short, A.R. about 1·0. *Thorax* blackish, shoulders slightly paler, heavily dusted with grey, dorso-central bristles uniserial, only present on posterior two thirds. *Legs* mainly blackish brown, femora paler at the base, tibiae slightly paler except at tips; L.R. 0·6. *Wings* as in *africanus*, halteres pale. *Abdomen* black with mixed dark and pale hair; hypopygium (Text-fig. 7, *b*) with coxite lobe more like *latistilus* than *africanus* but larger, style broad but not as broad as in *latisilus*, margins sinuous, not incurved at apex, anal point absent.

Female not known.

Holotype male, NATAL: Natal National Park, 13.iv.54 (*W. D. Oliff*), in the British Museum.

Cardiocladius latistilus sp. n.

Thorax black, uniformly and heavily grey dusted, femora with dark markings, abdomen with pruinose rings at apices of segments. Distinguished from *C. africanus* and *oliffi* by the triserial dorso-central bristles and from all species by the very broad male styles.

Male. Wing length 2·5–2·75 mm.

Head brown, face yellowish, palpi dark, antennae dark, rather short, A.R. 1·0, plumes whitish. *Thorax* black, heavily grey dusted, stripes just distinguishable, prothorax and pleural membrane paler, prescutellar area brown tinged; acrostichal bristles absent, dorso-centrals irregularly triserial, short and white, pits very distinct, absent from anterior third of mesonotum. *Legs* yellow and brown; anterior legs with yellow coxae, trochanters and basal half of femora, remainder blackish brown,

L.R. 0·75 ; middle and posterior femora yellow with a broad brown median band, knees, tips of tibiae and tarsi blackish, remainder of tibiae and basal half of basitarsi yellowish. *Wings* as in *africanus*, halteres whitish. *Abdomen* black with pale hair, each segment with an apical grey pruinose ring occupying a quarter or one-third.

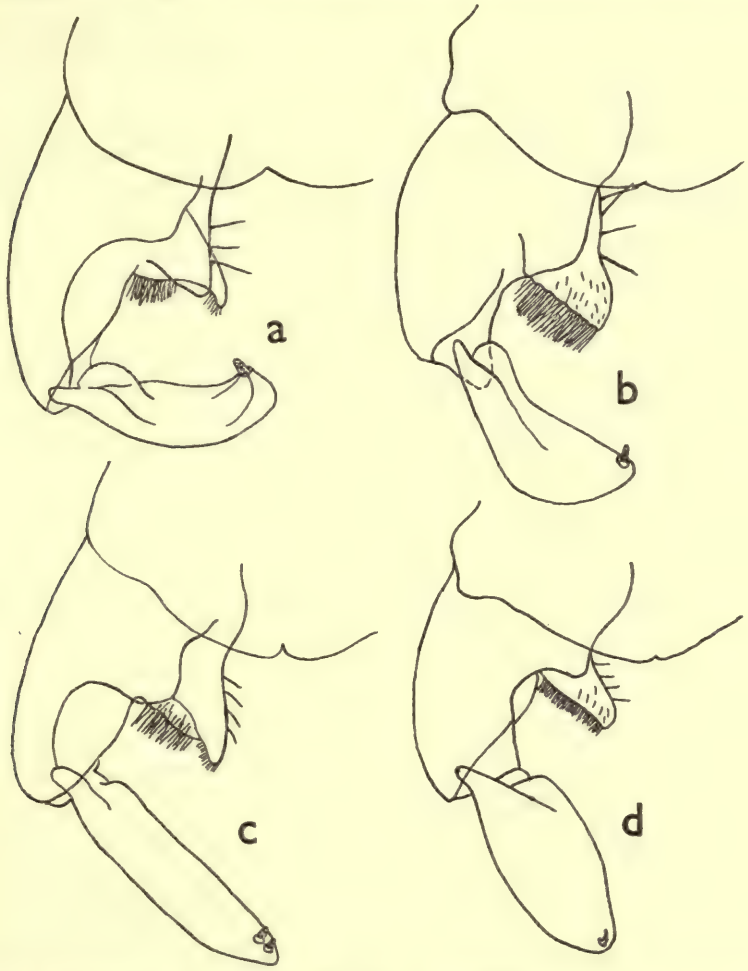

FIG. 7. Male hypopygia of *Cardiocladius*. (*a*) *C. africanus* ; (*b*) *C. oliffi* ; (*c*) *C. hessei* ; (*d*) *C. latistilus*.

Hypopygium (Text-fig. 7, *d*) with a very characteristic broad and flattened style, with a single small apical spine ; coxite lobe also distinctive and simple, anal point absent.

Female very similar to male ; one specimen has wing length only 2·0 mm.

Holotype male and 2 paratypes NATAL : Natal National Park, 12.v.54 (*W. D. Oliff*). Other paratypes, TRANSVAAL : 1 ♀, Olifants River, Loskop Dam, v.1955

and 2 ♀, Swaziland, Komati River, v.1955 (*A. D. Harrison*). Holotype in British Museum.

Cardiocladius hessei sp. n.

A fairly large yellowish brown species, the only African species known to me with separate scutal stripes in the male. Dorso-central bristles small and biserial, male styles parallel-sided and with two apical spines in the only known specimen.

Male. Wing length 3·0 mm.

Head brownish yellow, palpi brown, antennae rather short, A.R. about 0·8, plumes greyish. *Thorax* with a brownish yellow background, stripes dark brown and separate, the central one reaching back to the scutellum ; scutellum and prothorax yellow, postnotum and sternopleuron brown ; whole thorax lightly dusted with grey. Acrostichal bristles absent, dorso-centrals shorter and much less obvious than in the other species, whitish and biserial. *Legs* mainly yellow ; anterior femora dark at apex, tibiae and tarsi blackish brown, L.R. 0·7 ; middle and posterior knees slightly darkened, their tibiae and tarsi tinged with brown. *Wings* as in *africanus*, halteres yellow. *Abdomen* mainly yellowish, darker at the base, each segment paler on apical half, pubescence pale. Hypopygium (Text-fig. 7, *c*) with well developed coxite lobe, style quite straight and parallel-sided, somewhat flattened and with two apical spines, anal point absent.

Female not known.

Holotype male, Cape Province, Montagu, x.1910 (*R. Tucker*) in the South African Museum.

I take pleasure in naming this species in honour of Dr. A. J. Hesse, Curator of Insects in the South African Museum.

Genus ***PSECTROCLADIUS*** Kieffer

Psectrocladius Kieffer, *Mém. Soc. sci. Brux.* **30**, 356 ; Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 331 (as a subgenus of *Spaniotoma*).

Eyes bare. Pulvilli present, broad and distinct, usually little shorter than the claws. Wings without either macrotrichia or distinguishable microtrichia, R_{2+3} ending midway between R_1 and R_{4+5}, Cu not or scarcely bent, An reaching far beyond posterior fork, squama with a complete fringe.

As explained earlier, I am following Edwards' (1929) definition of this group, but I prefer to regard it as a full genus and not a subgenus of *Hydrobaenus* (*Spaniotoma*).

Kieffer has described two species in this genus and I have been able to examine the types of both. The type of the first, *P. alpinus* Kieffer (1913, *Voy. Alluaud Jeanel Afr. Or. Ins. Dipt.* **1** : 29) is in the Muséum National d'Histoire Naturelle, Paris. It is a female of *Orthocladius sensu lato*, definitely not a *Psectrocladius* as restricted by Edwards, but being in spirit it was difficult to identify further, especially in the absence of a male.

I have been able to borrow the type of the second species, which is *P. rhodesiae* Kieffer (1924, *Ann. Soc. sci. Brux.* **43** (1) : 260), from the South African Museum,

Cape Town, and have found that it is not an Orthocladiine at all. This is fairly clear from the original description, which states that the eyes are strongly narrowed above. It is in fact a female *Cryptochironomus*, not in a very good condition, close to, but probably different from *C. forcipatus* Freeman.

The species given below is the only true *Psectrocladius* known to me from Africa south of the Sahara.

Psectrocladius viridescens Freeman.

Psectrocladius viridescens Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 133.

Thorax greenish in male with reddish stripes, front legs dark, halteres pale, tibiae with one spur only, male hypopygium with conical anal point.

Male. Wing length 2·4 mm.

Head greenish, mouthparts brown, antennae brown, plumes pale, A.R. 1·5. *Thorax* greenish, mesonotal stripes separate and reddish, scutellum greenish, postnotum and sternopleura dark brown. *Legs* greenish yellow, front legs dark brown except for the femora, which are pale beneath ; front tarsi with slight beard, L.R. 0·75 ; each tibia with a single spur only, pulvilli broad and well developed. *Wings* with produced anal lobe and fringed squama, costa slightly produced, posterior fork beyond cross-vein, Cu very slightly curved, An nearly reaching wing margin. Halteres pale. *Abdomen* blackish, hypopygium (Text-fig. 8, *a*) with well formed conical anal point ; coxites narrow, inner lobe triangular, inner margin of styles straight.

Female similar to male ; thorax yellow rather than green, abdomen pale beneath and on segment 9.

Holotype male in British Museum.

Distribution. Cape Province : 1 ♂, (holotype), Bergvliet, x.1952 (*K. M. F. Scott*). Transvaal : Johannesburg, 1 ♂, iv.1954 and 1 ♀, vii.1954 (*A. D. Harrison*) ; 6 ♂, 2 ♀, Pretoria, iii.1954 (*G. Rudebeck*). A single male, Transvaal, Olifantsvlei, viii.1954 (*A. D. Harrison*), has the thoracic stripes blackish and partially fused ; I am treating this as a colour variety.

Genus ***CHAETOCLADIUS*** Kieffer

Chaetocladius Kieffer, 1911, *Bull. Soc. ent. France* **1911**, 182 ; Goetghebuer, 1942, *in* Lindner, *Flieg. Pal. Reg.* **3** (13), 57 (as subg. of *Orthocladius*).

Spaniotoma subg. *Orthocladius* Groups A and B, Edwards 1929, *Trans. ent. Soc. Lond.* **77**, 337–8.

Bryophaenocladius Thienemann, 1934, *Encycl. Ent. Dipt.* **7**, 36.

Eudactylocladius Thienemann, 1935, *Stett. ent. Zeit.* **96**, 206 ; Goetghebuer, 1942, *in* Lindner, *Flieg. Pal. Reg.* **3** (13), 63 (as subg. of *Orthocladius*) ; Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 202.

Eyes bare ; humeral pits small, dorso-central hairs long and erect, their punctures easily visible ; wing membrane with distinguishable microtrichia, usually visible under the low power of a monocular microscope (× 100), readily distinguishable under a higher power ; squamal fringe present ; scutellum slightly and uniformly shining ; the smooth bare area at its base scarcely distinguishable ; empodium distinct.

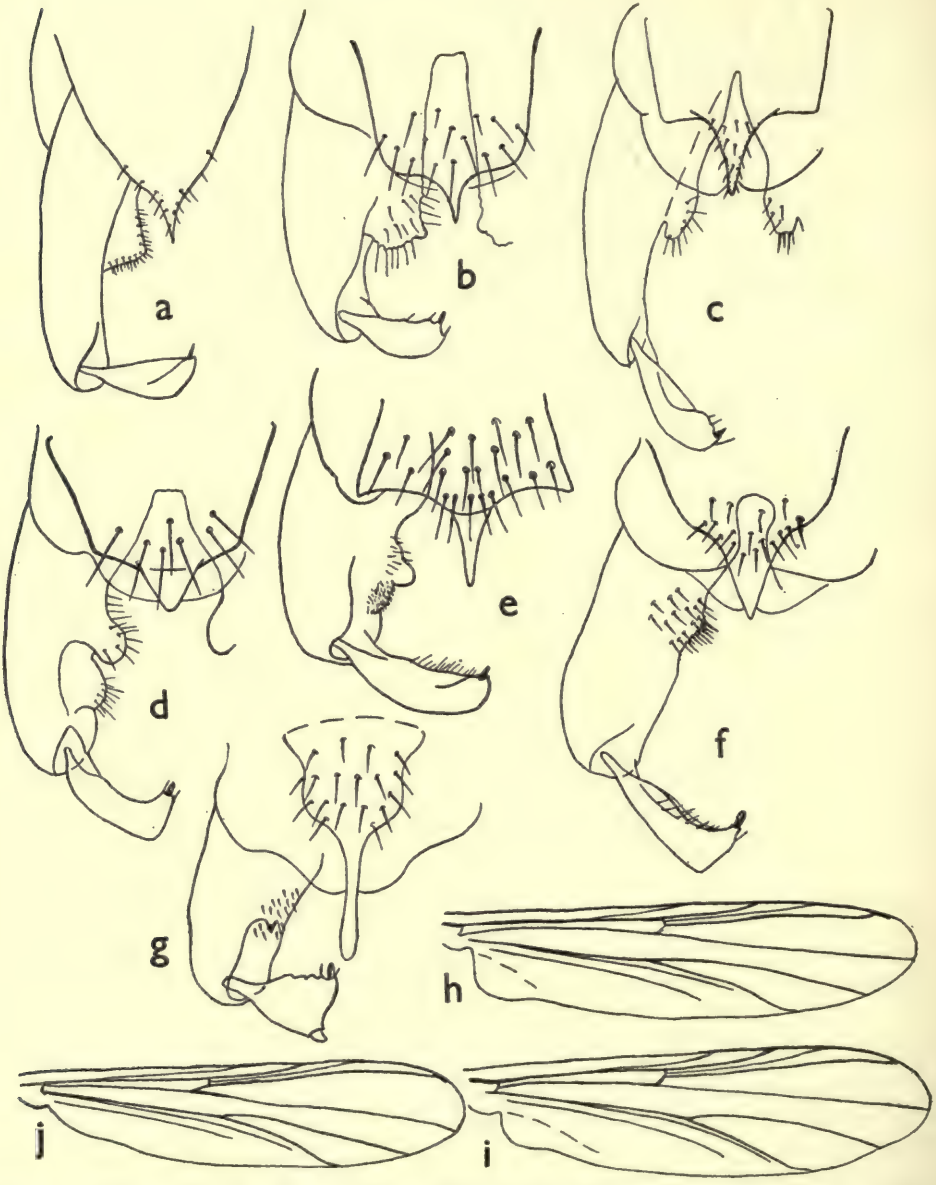

FIG. 8. Male hypopygia and wings of *Psectrocladius* and *Chaetocladius*. (*a*) *P. viridescens*; (*b*) *C. melaleucus*; (*c*) *C. excerptus natalensis*; (*d*) *C. ruwenzoriensis*; (*e*) *C. productus*; (*f*) *C. brincki*; (*g*) *C. eastopi*; (*h*) *C. melaleucus*; (*i*) *C. excerptus natalensis*; (*j*) *C. ruwenzoriensis*.

Edwards (1929) did not consider the presence of distinct microtrichia on the wing membrane warranted more than species group status of his subgenus *Orthocladius*. As explained earlier, where there are reasonable characters for their separation, I am treating these groups as genera. *Bryophaenocladius* and *Eudactylocladius* do not seem to me to be sufficiently different for generic separation from *Chaetocladius*, although Goetghebuer (1942) separated them as a single subgenus of *Orthocladius*, that is, he gave them equal rank to *Chaetocladius*. He used the later name *Eudactylocladius*, giving the earlier *Bryophaenocladius* as a synonym, which is, of course, inadmissible under the Rules of Nomenclature.

The material at my disposal includes two species which are so similar to two Palaearctic species that I have had to treat one as identical and give the other subspecific status. I am unable to include *C. pallidus* Kieffer in the key.

KEY TO AFRICAN SPECIES OF *Chaetocladius*

1. Anal vein reaching well beyond posterior fork (Text-figs. 8, *h*, *i*) 2
   Anal vein ending only just beyond fork (Text-fig. 8, *j*) 3
2. Thorax dull black with 2 brilliant silvery pruinose stripes along lines of dorso-central bristles . . . . . *melaleucus* Meigen
   Thorax shining and without these stripes . . *excerptus* Walker subsp. *natalensis* nov.
3. Male hypopygium with short broad anal point (Text-fig. 8, *d*) ; female antenna with forked sensory bristles, wings of male with reduced anal lobe (Text-fig. 8, *j*) *ruwenzoriensis* sp. n.
   Anal point longer, female lacking forked sensory bristles, wings of male with larger anal lobe 4
4. Anal point of male very long (Text-fig. 8, *g*) . . . . . *eastopi* sp. n.
   Anal point shorter 5
5. Styles of male rounded, anal point narrower (Text-fig. 8, *e*) . . *productus* Freeman
   Styles of male angulated, anal point broader (Text-fig. 8, *f*) . . . *brincki* Freeman

Chaetocladius melaleucus Meigen

Chironomus melaleucus Meigen, 1818, *Syst. Beschr.* **1**, 39.
Spaniotoma melaleuca Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 337.

A species with conspicuous silvery stripes along the lines of the dorso-central bristles. I am quite unable to find any differences whatsoever between the African specimens and specimens from Britain.

Male. Wing length 3·0 mm.

Head, antennae and mouthparts black with some grey dusting ; A.R. about 1·75 (in British specimens it is variable and may be as low as 1·5). *Thorax* matt black with conspicuous silvery pruinosity on shoulders, along lines dorso-central bristles and on two rectangular patches on prescutellar area ; pleura pruinose but not as strongly as on shoulders ; bristles pale. *Legs* blackish, L.R. about 0·6, empodium well developed, middle tibia with two short spurs. *Wings* with well developed microtrichia ; venation as in Text-fig. 8, *h*, posterior fork long and narrow, anal lobe slightly produced, squamal fringe complete. Halteres dark brown (in British specimens they vary from yellow to brown). *Abdomen* blackish, hairs paler. Hypo-

pygium (Text-fig. 8, *b*) with short sharp anal point, exactly similar to British specimens.

Female similar to male in colour and pattern, except for scutellum which is brown.

DISTRIBUTION. UGANDA: 1 ♂, 1 ♀, Kigezi Province, Mt. Muhavura, 13,000 ft., xi.1934 (*J. Ford*); 1 ♂, Ruwenzori Range, Lake Bujuku, 13,050 ft., vii.1952 (*D. S. Fletcher*).

Chaetocladius excerptus Walker subsp. ***natalensis*** subsp. n.

C. excerptus, a Palaearctic species described from Britain (Walker, 1856, *Ins. Britannica* **3**, 179), differs from the other members of the genus by the strong pits to the dorso-central bristles, by the hairy anal point and by the costa ending at the tip of R_{4+5}. These characters make it readily recognizable. The African specimens are identical in all respects except for the shorter antennal ratio (0·6 against 1·2) and the smaller anal lobe to the wing. As both these characters are somewhat variable I prefer to treat the specimens as belonging to a subspecies of *excerptus* rather than to a distinct species.

Male. Wing length 2·0 mm.

Head, antennae and mouthparts blackish; antennae rather short, especially apical segment, so that A.R. only about 0·6. *Thorax* of holotype with stripes, postnotum and sternopleuron black, ground colour of mesonotum yellowish, prescutellar area brown; mesonotum rather brightly shining though not brilliant; in paratype the stripes are partially fused; this colour variation is exactly as in typical subspecies. Pits from which dorso-central bristles arise well developed, larger than usual, bristles black. *Legs* brown, L.R. about 0·8, pulvilli absent, empodium present, both spurs on middle tibia very short. *Wings* with well developed microtrichia on the membrane, anal lobe reduced, venation as in Text-fig. 8, *i*, costa not produced, squama with fringe, halteres with dark knobs. *Abdomen* very dark brown, bristles black; hypopygium (Text-fig. 8, *c*) with hairy anal point, exactly similar to typical subspecies.

Female not known.

Holotype male, NATAL: Kamberg Game Reserve, Mooi River, 6,000 ft., ix.1953 (*A. D. Harrison*); paratype, 1 ♂, TRANSVAAL: Lydenburg Distr., Waterval, Mt. Rang Rang, iv.1955 (*A. D. Harrison*), both in British Museum.

Chaetocladius ruwenzoriensis sp. n.

A large black species, female with forked sensory bristles on basal half of antenna, male with short triangular anal point. For these reasons it does not fit exactly into the grouping given by Edwards (1929) for the British species of his subgenus *Orthocladius* Group B, the female falling into series 1 and the male into series 2. It is not unlike the Palaearctic species *vernalis* Goetghebuer in general appearance.

Male. Wing length 3·0 mm.

Head, mouthparts and antennae black, pedicel and vertex pruinose, plumes black; A.R. about 0·75. *Thorax* mainly black, prothorax, shoulders and lateral margins yellowish brown, dorso-central bristles black and uniserial; seen from the front, mesonotum slightly shining, prescutellar area pruinose; pleural membrane yellowish,

scutellum brown, remainder of thorax black with some pruinosity. *Legs* blackish brown, L.R. 0·7, pulvilli absent, empodium present, middle tibia with outer spur half length of inner. *Wings* (Text-fig. 8, *j*) colourless by transmitted light, microtrichia well developed, anal lobe absent, squama with fringe of about 4 hairs, venation as in figure. Halteres pale. *Abdomen* very dark brown, hairs blackish. Hypopygium (Text-fig. 8, *d*) with blunt bare anal point, IXth tergite hairy, coxite lobes separated, style angulated.

Female. Very similar to the male in colour; antennae with sensory bristles forked on the basal half.

Holotype male and paratypes 1 ♂, 1 ♀, UGANDA: Kigezi Distr., Mt. Muharura, 10–12,000 ft., xi.1934 (*F. W. Edwards*), all in British Museum.

Chaetocladius productus Freeman

Eudactylocladius productus Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 202.

Quite closely resembles the Palaearctic species *C. nitidicollis* Goetghebuer, but easily distinguished by the different coxite lobe and the apical single spine to the style. Black, without paler markings in the male, female with scutal stripes more or less separated; cross-vein oblique, sensory hairs of female antenna simple. Separated from the previous three species by the shorter anal vein and the much smaller size; externally inseparable from the following two species.

Male. Wing length 1·5 mm.

Head, antennae and mouthparts black, A.R. variable, 2–3·0. *Thorax* black, pleural membrane brownish, scutum with some pruinosity along the lines of the dorso-central bristles. *Legs* pitchy, empodium distinct, L.R. about 0·7. *Wings* with microtrichia just distinguishable under a magnification of × 200; venation very similar to *ruwenzoriensis* (Text-fig. 8, *j*), costa perhaps more produced, reaching about one-third the distance to M, anal lobe more produced, nearly right angled; squama with 4 bristles. Halteres dark. *Abdomen* black; hypopygium (Text-fig. 8, *e*) with well formed, bare, anal point; IXth tergite hairy, coxite rather short with inner lobe as shown, style without inner flange, sometimes broader than shown, apical spine simple.

Female. Paler than male, head yellowish, thorax yellowish with separate black stripes, scutellum, postnotum and sternopleuron dark; sensory hairs of antenna simple, last segment as long as two preceding together.

Holotype male in British Museum, type locality, CAPE PROVINCE, Berg R., Wellington.

DISTRIBUTION. CAPE PROVINCE: series of both sexes, Berg River, Wellington, v.1952 and iv.1953 (*K. M. F. Scott*); 1 ♂, Mossel Bay, ii.1922 (*R. E. Turner*). NATAL: 3 ♂, 2 ♀, Weenen, xii.1923–i.1924 (*H. P. Thomasset*). TRANSVAAL: 3 ♂, 1 ♀, nr. Johannesburg, Witpoortjie Falls, xi.1954 (*A. D. Harrison*). BELGIAN CONGO: 5 ♂, P.N.A., cratère Mugunga, 1933 (*de Wulf*, in Mus. R. Congo belge). KENYA: long series in spirit, Muguga, i.1953, v.1953, x.1953 (*V. F. Eastop*). ETHIOPIA: 1 ♂, Waldia, ii.1936 (*J. W. S. Macfie*). GOLD COAST: 1 ♂, Accra iv.1911 (*A. Connal*).

Chaetocladius brincki Freeman

Eudactylocladius brincki Freeman, 1955, *South African Animal Life.* Uppsala, **2**, 252.

Typically, this species only differs from *productus* in the structure of the male hypopygium (Text-fig. 8*f*) in which the anal point is broader, the IXth tergite of a different shape, the coxite lobe reduced and the style angulated. However, there are some specimens in which the style is more rounded and the coxite lobe larger, which suggests that the two species may not really be distinct.

Holotype male in Lund University Museum.

DISTRIBUTION. CAPE PROVINCE: holotype male, Tzitzikama Forest, Storms River (*P. Brinck*). BELGIAN CONGO: 1 ♂, 3 ♀, P.N.A., cratère Mugunga (*de Wulf*); 2 ♂, Lulenga, Mission Rugari (*de Wulf*), all in Mus. R. Congo Belge. KENYA: 3 ♂, Molo, x.1954 (*V. F. Eastop*); 6 ♂, 1 ♀, Aberdare Range, Mt. Kinangop, 8,000 ft., x.1934 (*F. W. Edwards*).

Chaetocladius eastopi sp. n.

This species is known to me only as two males mounted on slides. It appears to be separable from *productus* and *brincki* only by the structure of the male hypopygium (Text-fig. 8, *g*). Anal point long and narrow, IXth tergite with a waist, inner coxite lobe very small, styles triangular and with a spur on their outer angle.

Holotype male and paratype 1 ♂, KENYA: Nachingwea, xi.1953 (*V. F. Eastop*), both in British Museum.

Chaetocladius pallidus Kieffer

Dactylocladius pallidus Kieffer, 1918, *Ann. Mus. nat. Hung.* **16**, 82.

I have seen the holotype female of this species which is in the Hungarian National Museum. It is a small yellow *Chaetocladius* falling into group B of Edwards' (1929) classification. Thoracic markings reddish; wings torn, but posterior fork well distal to cross vein, distinct microtrichia present; squama with one hair, antennal sensory hairs simple. It is very similar to *brincki*, but is smaller and paler. It will be necessary to examine more material from the type locality before any final description can be made.

Type locality, ABYSSINIA, Marako.

Genus *ORTHOCLADIUS* van der Wulp

Orthocladius van der Wulp, 1874, *Tijdschr. v. Ent.* **17**, 132; Kieffer, 1906, *Genera Insect.* fasc. **42**, 25 (in part).
Spaniotoma subg. *Orthocladius* Groups C–F, Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 344–50.
Orthocladius sens. str. and subg. *Pseudorthocladius* Goetghebuer, 1932, *Faune de France* **23**, 84, 93; Goetghebuer, 1942, in Lindner, *Die Flieg. Pal. Reg.* **3** (13), 31 and 73.
Pseudorthocladius (Goetghebuer) Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 134.
Hydrobaenus (Fries) Edwards, 1940, *Ibid.* **9**, 154–6 (in part).

Eyes bare; wing membrane without distinguishable microtrichia even under a 1/6 in. objectives; smooth bare area at base of scutellum usually sharply marked

off from dull apical area; empodium variable, pulvilli absent; squama fringed, R_{2+3} ending distinctly in costa, clearly separated from R_{4+5}.

With the restriction of this genus to Groups C–F of Edwards' (1929) classification, the name *Spaniotoma* is excluded because of the uncertainty of its position. I prefer to regard *Hydrobaenus* Fries as a separate genus because of the reduced antennae and palpi, and the large prothorax. It has a different appearance because of the shorter, thicker legs with tarsal segment 4 shorter than 5. I am not now recognizing *Pseudorthocladius* as a genus or subgenus because the characters for its definition are slight and there are few species included.

Apart from the seven species keyed below, there are five other species described by Kieffer, three in *Dactylocladius*, one in *Camptocladius*, and one in *Psectrocladius* which may belong here, but which it is not possible to place accurately at present. Brief diagnoses and notes on these are given at the end of the genus.

KEY TO AFRICAN SPECIES OF *Orthocladius*

1. Costa not clearly produced (Text-fig. 9, *a*) 2
   Costa clearly produced (Text-fig. 9, *b–d*) 4
2. Squama with complete fringe, thorax dull with grey pruinosity . *bergensis* Freeman
   Squama with only 2–3 hairs, thorax rather shining 3
3. Halteres blackish, A.R. about 2·0 . . . . . *nigerrimus* Kieffer
   Halteres white, A.R. about 1·5 . . . . . *pretorianus* Kieffer
4. Posterior fork wide (Text-fig. 9, *b*, *d*) 5
   Posterior fork narrow (Text-fig. 9, *c*) 6
5. Posterior fork very short, costa greatly produced (Text-fig. 9, *d*) . *megalochirus* Kieffer
   Posterior fork longer, costa less produced (fig. 9, *b*) . . . . *lobiger* Freeman
6. Entirely black in both sexes except for halteres . . . . . *conicus* Freeman
   Thorax with some paler areas either laterally or on shoulders, or stripes may be brown . . . . . *similis* Freeman

Orthocladius bergensis Freeman

Orthocladius bergensis Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 135.

A fairly large species, dark in the male with pruinose mesonotum, similar to European species of the *thienemanni* group. The female has separate mesonotal stripes and elongate apical antennal segment.

Male. Wing length 2·25 mm.

Head dark, face yellow; antennal pedicel black, flagellum and plumes pale, A.R. about 1·2. *Thorax* largely dull black with grey pruinosity, prothorax yellow; mesonotum paler on lateral margins, brownish on shoulders, stripes fused but just distinguishable by their slightly darker colour in most specimens; pleural membrane yellow, scutellum, postnotum and sternopleuron black. *Legs* uniformly brown, L.R. 0·7, pulvilli absent. *Wings* brownish by transmitted light; R_{2+3} ending at about one-third distance between R_1 and R_{4+5} (Text-fig. 9, *a*), costa not produced, posterior fork below cross-vein which is nearly transverse, lower branch of fork slightly arched; anal lobe well formed, squama with complete fringe. Halteres yellow. *Abdomen* black; hypopygium (Text-fig. 9, *e*) with hairy anal point, coxite with inner process, style rounded externally.

Female. Wing length 2–2·25 mm.

Head and pedicel yellow, scutal stripes separate, ground colour of mesonotum yellow with grey pruinosity, pleura largely yellow, sternopleuron black on ventral half, scutellum brown, postnotum black; antennal segments 3–5 moniliform, 6 as long as 3–5 together; wing venation as in male, halteres yellow; abdomen brownish.

Holotype male in British Museum, type locality Cape Province, Berg River, Wellington.

DISTRIBUTION. CAPE PROVINCE: type series from Berg River, Wellington and Piquetberg v–vii.1952 and ix.1952 (*K. M. F. Scott*); 1 ♂, Mossel Bay, viii.1932 (*R. E. Turner*); 1 ♂, Table Mt., vii.1951 and 19 ♂, Rhodes, iii.1951 (*P. Brinck*). NATAL: 5 ♂, 3 ♀, Mooi River, Keate's Drift, vii–viii.1954 (*W. D. Oliff*). TRANSVAAL: 7 ♂, 4 ♀, Olifantsvlei, nr. Johannesburg, v–viii.1954 (*A. D. Harrison*).

Orthocladius conicus Freeman

Orthocladius conicus Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 201.

Entirely black except for halteres; A.R. 1·5; costa produced, anal lobe slightly produced; anal point short and bare.

Male. Wing length 1·6–1·75 mm.

Head, antennae and mouthparts black; A.R. about 1·5. *Thorax* quite black with some greyish pruinosity, dorso-central bristles uniserial. *Legs* brownish black, trochanters paler, empodium small, pulvilli absent, L.R. 0·6. *Wings* with costa produced for about one-third of distance from R_{4+5} to M_{1+2}, r–m not particularly transverse, posterior fork slightly distal to cross-vein, Cu slightly curved, An reaching well beyond fork; anal lobe distinguishable but rounded and only slightly produced; squama with fringe of about 7 hairs. Halteres yellowish white. *Abdomen* black; hypopygium (Text-fig. 9, *f*) with anal point short and conical, of variable width, broader in holotype than in other males; anal point bare, IXth tergite hairy on its apical half; coxite with small inner lobe, style simple.

Female very similar to male, costa more strongly produced; last antennal segment shorter than in *bergensis*, only equal to 4–5 together.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE: 2 ♂ including holotype, Berg River, Piquetberg, ix.1952, 7 ♀, iv.1953; 1 ♀, Bergvliet, v.1953; 1 ♀, Wellington, v.1953 (all coll. *K. M. F. Scott*).

Orthocladius lobiger Freeman

Pseudorthocladius lobiger Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 201.
Orthocladius reductus Freeman, 1954, *Ibid.* **23**, 173 (SYN. NOV.).

Owing to an error in generic determination this species was unfortunately described twice. It is easily recognized in both sexes by the venation and the flattened fifth tarsal segment; male with terminal antennal segment bilobed and anal point very short. It belongs to Edwards' Group D and is close to the European species *apicalis* Kieffer from which it may readily be separated by the absence of macrotrichia at the wing tip.

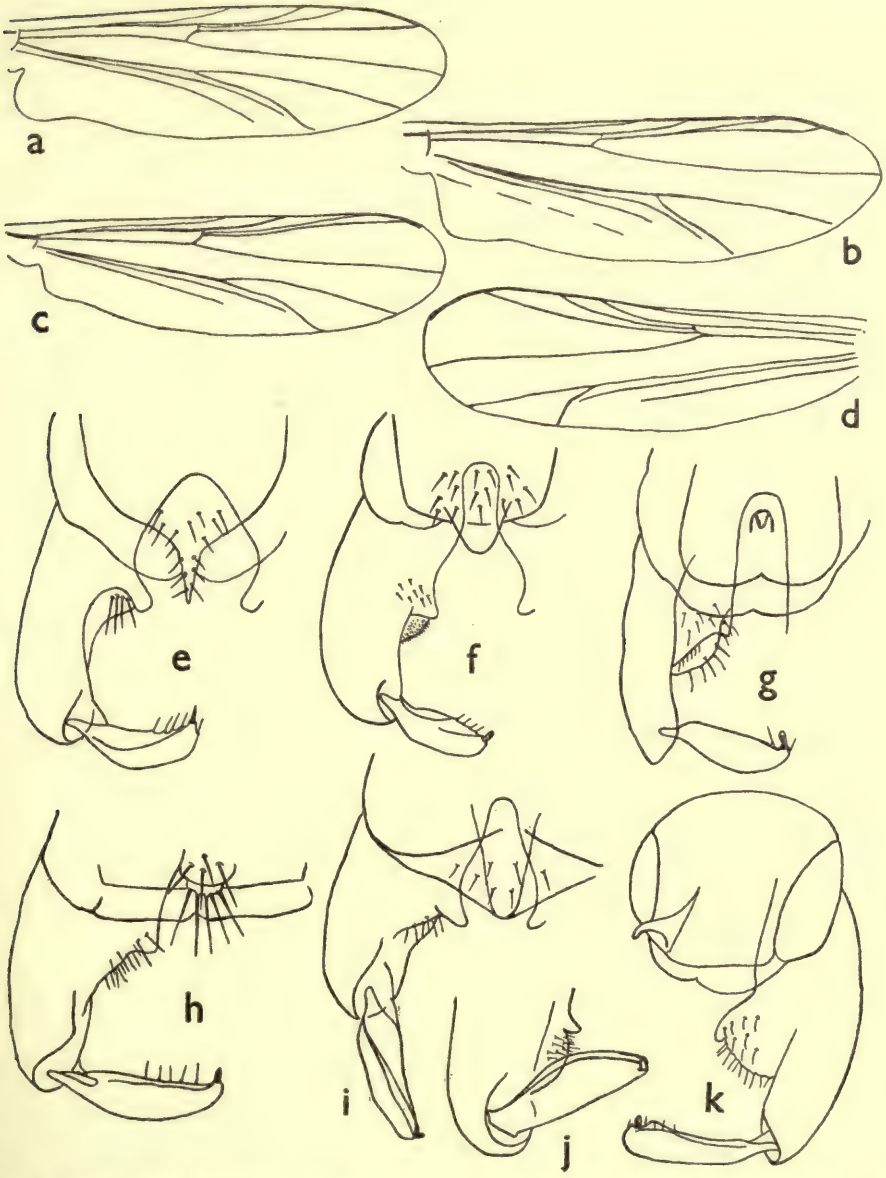

FIG. 9. Wings and hypopygia of *Orthocladius*. (*a*) *O. bergensis* ; (*b*) *O. lobiger* ; (*c*) *O. similis* ; (*d*) *O. megalochirus* ; (*e*) *O. bergensis* ; (*f*) *O. conicus* ; (*g*) *O. lobiger* ; (*h*) *O. similis* ; (*i*) *O. nigerrimus* ; (*j*) *O. nigerrimus* with style from different aspect ; (*k*) *O. megalochirus* from half side.

The antennal ratio and size of wing lobe are both highly variable. This seems to be correlated to some extent with size ; the smaller specimens have a low A.R. and an obtuse lobe, the larger ones have A.R. as much as 0·8 and the lobe slightly produced, also the plumes are better developed. The hypopygium, wing venation and leg structure are identical for all specimens and intermediate stages of A.R. and wing lobe are present in the series examined ; I am therefore treating them as belonging to the same species.

Male. Wing length 1·5–6 mm.

Head brownish black, mouthparts and antennae black ; A.R. varying from 0·25–0·8, plumes scanty and not very long, last segment clubbed and with short hairs, bilobed as in *Nanocladius biloba* Freeman (Text-fig. 11, *g*). *Thorax* black, slightly shining, stripes more or less fused, shoulders pale, scutellum brown. *Legs* dark brown, L.R. about 0·8, pulvilli present as short rounded pads, empodium long, last tarsal segment dorso-ventrally flattened. *Wings* tinged with brownish ; costa slightly produced (Text-fig. 9, *b*) R_{2+3} close to R_{4+5} for most of its length but ending separately and quite distinctly in the costa ; posterior fork well distal to cross-vein, Cu_1 straight, An ending opposite fork ; anal lobe either obtuse or slightly produced, squama with fringe of 3–5 hairs. Halteres brown. *Abdomen* black, hypopygium (Text-fig. 9, *g*) with extremely short anal point, coxa narrow with well developed inner lobe.

Female similar to male ; antennae short, segment 6 not bilobed and equal to 4–5 together ; last tarsal segment flattened, venation as in male. In some specimens stripes separate, ground colour of thorax pale.

Holotype males of both species in British Museum, type locality of *lobiger*, Cape Province : Berg River, Wellington, of *reductus*, Berg River, Assegaibos.

Distribution. Cape Province : various localities along Berg River and at Kirstenbosch, v.1952, x.1952, iv–v.1953 (*K. M. F. Scott*). Natal : 1 ♂, Natal Nat. Park, Oliviershoek Bridge, viii.1954 (*W. D. Oliff*) ; 3 ♂, Mooi River, Mont aux Sources, xi.1954 (*W. D. Oliff*).

Orthocladius similis Freeman

Pseudorthocladius similis Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 134.

This species was described from a single male from the Cape resembling the European species *O. curtistylus* Goetghebuer. The type is a small black insect with mesonotum yellow laterally. More material is now available of both sexes and it is seen to be quite variable in colour. Another Cape male has shoulders and pleura yellow ; the female is pale brown with darker stripes on the thorax. Males from Belgian Congo are brown rather than black, resembling the females, but occasional darker specimens are to be found ; in addition the width of the styles varies. All agree in the structure of the ninth tergite (Text-fig. 9, *h*) and in wing venation ; narrow pulvilli present.

Male. Wing length 1·5 mm.

Head brown, mouthparts and antennae, including plumes black ; A.R. about 0·9. *Thorax* of holotype black, mesonotal stripes indicated by pruinosity along lines of dorso-central bristles ; lateral mesonotal margins narrowly yellow and with some

yellow on upper parts of pleura; other specimens have more yellow, especially on shoulders, or are brownish yellow with brown stripes. *Legs* uniformly dark brown, empodium well developed, narrow pulvilli present. *Wings* slightly purplish by transmitted light; venation as in Text-fig. 9, *c*, costa produced, posterior fork beyond cross-vein; anal lobe small but distinguishable, squama with fringe of 4–5 hairs. Halteres black in type, paler in pale specimens. *Abdomen* black; hypopygium (Text-fig. 9, *h*) without anal point but with slight prominence bearing hairs, coxite lobe small, style of holotype narrow but in other specimens may be more expanded.

Female pale brown with darker brown thoracic markings, shoulders yellow; antennae with 6 segments, the last segment one and a half times as long as 5.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE: 2 ♂, 2 ♀, including holotype, Berg River, ix–x.1952 and i–ii.1953 (*K. M. F. Scott*). NATAL: 1 ♂, 1 ♀, Mooi River, Kamburg Game Reserve, ix.1953 (*A. D. Harrison*). BELGIAN CONGO: 4 ♂, Rutshuru, i.1934 (*de Wulf*); 2 ♀, Nylragongo, 10,000 ft. (*de Wulf*); 1 ♂, Musosa, x.1939 (*H. J. Brédo*); 1 ♀, Elizabethville, xii.1939 (*H. J. Brédo*).

Orthocladius nigerrimus Kieffer

Camptocladius nigerrimus Kieffer, 1918, *Ann. Mus. nat. Hung.* **16**, 81.

I have been able to borrow a cotype male of this species and can state that it does not belong to *Camptocladius* (*Smittia*) as now defined because of the presence of squamal hairs.

Black, rather shining, posterior fork shorter than in *similis*, A.R. about 2·0, halteres blackish, male hypopygium very characteristic.

Male. Wing length 1·25 mm.

Head, mouthparts, antennae black, A.R. about 2. *Thorax* shining black, stripes fused. *Legs* dark brown, L.R. 0·4, pulvilli absent. *Wings* slightly brownish by transmitted light, anal lobe as in *similis*; venation differs from *similis* (Text-fig. 9, *c*) by the shorter posterior fork and by the costa not being clearly produced (Kieffer says it is strongly produced, but this seems to be wrong). Halteres blackish. *Abdomen* black; hypopygium (Text-figs. 9, *i*, *j*) very characteristic; IXth tergite with slight conical central ridge but no anal point; coxite lobe as shown; style rather tapered, with small apical spine which is obscured in some aspects (Text-fig. 9, *j*), and with a narrow transparent inner margin which is quite typical.

Female small and black, very similar to the male. Antennae with 6 segments, last segment one and a half times as long as 5, segments 3–5 twice as long as wide.

Described by Kieffer from two males in Hungarian National Museum. Type locality, ETHIOPIA: Sidamo.

DISTRIBUTION. CAPE PROVINCE: 1 ♂, Mossel Bay, ii.1922 (*R. E. Turner*). NATAL: 5 ♂, Weenan, xii.1923 (*H. P. Thomasset*). BELGIAN CONGO: 3 ♂, 2 ♀, Escarpment Kabasha, Chambi, x.1933 (*de Wulf*); 3 ♂, Parc. Nat Albert, cratère Mugunga (*de Wulf*); 1 ♂, N. Kivu, Kibati, x.1933 (*de Wulf*). ETHIOPIA: 16 ♂, River Alamata, Koram road, xi.1936 (*J. W. S. Macfie*).

Orthocladius megalochirus Kieffer

Dactylocladius megalochirus Kieffer, 1911, *Trans. Linn. Soc. Lond.* (*Zool.*) **14**, 363.

Easily distinguished from the other species by L.R. being almost 1·0, by the short posterior fork and by the greatly produced costa.

Male. Wing length 1·0 mm.

Head, antennae and mouthparts blackish, A.R. 0·6. *Thorax* black, slightly pruinose. *Legs* brown, L.R. almost 1·0, pulvilli absent, empodium not discernible in the holotype. *Wings* (Text-fig. 9, *d*) with characteristic venation, posterior fork being short and wide and the costa greatly produced, anal angle reduced, squama with two hairs; halteres pale. *Abdomen* black; hypopygium (Text-fig. 9, *k*) with bare thorn-like anal point which stands more or less vertically, coxite lobe well developed, style narrow.

Female not known.

Known only from the holotype male in the British Museum, Seychelles: Mahé, top of Mt. Sebert, 1,800 ft.

Orthocladius pretorianus Kieffer

Camptocladius pretorianus Kieffer, 1918, *Ann. Mus. nat. Hung.* **16**, 80.

I borrowed a cotype male of this species from the Hungarian National Museum but found that it lacked antennae, most of the legs and the hypopygium. Also the wings were folded and the venation difficult to see.

It is a small black fly with shining mesonotum and pale halteres; wing membrane without distinguishable microtrichia, squama with two hairs. In the original description Kieffer states that A.R. is 1·5, L.R. 2·0 and that the costa is not produced.

Type locality, TRANSVAAL: Pretoria.

? *Orthocladius alpinus* Kieffer

Psectrocladius alpinus Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1**, 29.

Although I have seen the type female of this species in Muséum National d'Histoire Naturelle, Paris, I was unable to examine it in as much detail as I would have liked and I am unable to place it accurately in a genus. It is clearly not *Psectrocladius* as now defined. I am placing it in *Orthocladius* until a more detailed examination can be made.

Female. Length 2 mm.

Clear yellow, thoracic markings and most of upper parts of abdomen brown black; eyes bare; antennae with six segments, 6 a little longer than 5; wings punctate, without distinguishable microtrichia, costa strongly produced, posterior fork distal to cross-vein; L.R. 0·5, narrow pulvilli present.

Type locality, KENYA: heath zone, 10–12,000 ft., i.1912.

? *Orthocladius lacustris* Kieffer

Dactylocladius lacustris Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1**, 30.

The type specimen of this species was not marked by Kieffer and I was uncertain which specimen was truly the type.

Female. Length 1·5 mm.

Brown black, halteres pale ; antennae 6 segmented, 6 nearly twice as long as 5 ; wings punctate, cross-vein oblique, costa strongly produced, posterior fork distal to cross-vein ; L.R. 2.

Type female in Muséum National d'Histoire Naturalle, Paris ; locality, KENYA : Naivasha, on the shore of the lake, 6,000 ft., xii.1911.

? *Orthocladius sancti-benedicti* Kieffer

Dactylocladius sancti-benedicti Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1**, 30.

I have seen the type series of this species but was unable to examine them closely enough to permit accurate placing in a genus.

Length : male 3 mm., female 2·5 mm.

Male entirely brown black, female greenish with brown antennae and legs ; A.R. nearly 2 ; female antennae 7 segmented, segments 3–6 subcylindrical, 7 twice as long as 6 ; wings punctate, costa well produced, posterior fork a little distal to cross-vein ; L.R. 0·7, pulvilli absent ; coxite lobe as wide as long, styles curved, extremity incurved.

Type series in Muséum National d'Histoire Naturelle, Paris, in spirit. Locality, KENYA : Forest of Nairobi, Kyambu, 5,300 ft., xi.1911.

? *Orthocladius kinangopi* Kieffer

Dactylocladius kinangopi Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1**, 31.

I have seen the female type of this species but was unable to examine it in sufficient detail to place it accurately in a genus.

Female. Length 2 mm.

Yellowish, antennae, and transverse ventral bands on abdominal segments brown, thoracic markings black brown, legs brownish ; antennae 7 segmented, segments 2 and 3 equal and cylindrical, 4 and 5 longer, narrower in apical third, 6 subcylindrical only half as long as 5, 7 twice as long as 6 ; wings punctate, costa produced, posterior fork distal to cross-vein ; L.R. 2.

Type female in Muséum National d'Histoire Naturelle, Paris. Type locality, KENYA : Aberdare Range, Mt. Kinangop, 8,500 ft., ii.1912.

? *Orthocladius nilicola* Kieffer

Dactylocladius nilicola Kieffer, 1923, *Ann. Soc. ent. France* **92**, 182.

The type of this species is lost and I am very doubtful of the genus to which it should be assigned. The following is a summary of the characters given by Kieffer.

Female. Length 1·0 mm.

Brown ; eyes bare ; antennae 6-segmented, yellow, pedicel brown, segment 2 as long as 3, 3–5 elongated, gradually contracted apically, 6 two and a half times as long as 5 ; wings finely punctate, the punctures almost setiform ; r–m cross-vein not formed, as in *Tanytarsus* ; costa greatly produced, for as much as one-third length of R_{4+5}, posterior fork distal to cross-vein ; L.R. 2, empodium longer than the claws ; abdomen with the posterior edge of the tergites paler.

Type locality, SUDAN : Shambe, ii.1912.

Genus *NANOCLADIUS* Kieffer

Nanocladius Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1**, 31 ; Freeman, 1954, *Proc. R. ent. Soc. Lond.* (B) **23**, 175.

Eukiefferiella Thienemann, 1926, *Arch. Hydrobiol.* **17**, 325 ; Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 350 ; Goetghebuer, 1944, in Lindner, *Flieg. Pal. Reg.* **3**, 114.

Microcricotopus Thienemann and Harnisch, 1932, *Zool. Anz.* **99**, 137.

Akiefferiella Thienemann, 1936, *Stettin. ent. Ztg.* **97**, 43.

Parakiefferiella Thienemann, 1936, *Ibid.* **97**, 43.

Camptokiefferiella Goetghebuer, 1944, in Lindner, *Flieg. Pal. Reg.* **3**, 122 (as subg. of *Eukiefferiella*).

Eyes bare or pubescent ; squama with incomplete fringe or bare ; wings without distinguishable microtrichia or macrotrichia ; R_{2+3} appearing absent owing to its lying in close contact with R_{4+5}, gradually fading out towards the tip and not distinctly reaching the costa ; costa retracted ; Cu_1 usually straight, fork fairly wide, anal lobe not produced ; pulvilli usually absent, when present quite small, empodium well developed.

Nanocladius was erected by Kieffer to include an East African species, *N. vitellinus* which automatically becomes the type species. As reported in 1954, I have been able to examine the female holotype and have found it to be a species of *Eukiefferiella* as defined by Edwards (1929), allied to the Palaearctic species *bicolor* Zetterstedt.

Microcricotopus was erected for a number of species including *Cricotopus albicornis* Goetghebuer (*Eukiefferiella bicolor* Zetterstedt) which was fixed by Goetghebuer (1944) as the type species. This genus will fall as a synonym of *Nanocladius*.

Edwards (1929) did not subdivide *Eukiefferiella* into subgenera, but Goetghebuer (1944) recognized five subgenera, four being groups earlier proposed by Thienemann as genera. Of the 30 Palaearctic species mentioned by Goetghebuer (1944), 21 fall into *Eukiefferiella* sensu stricto ; the remaining 9 are divided amongst the other subgenera, depending on the presence or absence of pulvilli, squamal hairs and eye pubescence, and the shape of Cu_1. The squamal hair fringe is tending to disappear throughout the genus and in one African species varies from 0–2 hairs, suggesting that this character is not very sound. The other characters used are also not very convincing because the pulvilli are small, the eye hairs tend to be fine and sparse and the shape of Cu varies a good deal in allied genera. It seems pointless in these circumstances to use subgenera based on rather insecure characters to split off small numbers of species. I am, therefore, considering all the subgenera to be synonyms of the earliest name, that is *Nanocladius*.

Kieffer has described only the one species *N. vitellinus* from Africa. Goetghebuer has described a species *E. metallescens*, but examination of the type has shown this to be a species of *Trichocladius* (q.v.). Most of the species described below are very similar to Palaearctic species.

KEY TO AFRICAN SPECIES OF *Nanocladius*

1. Eyes pubescent 2
   Eyes bare 3
2. Apical antennal segment with about 10–12 long curved hairs, plume hairs of male white. . . . . *vitellinus* Kieffer
   Apical antennal segment with short hairs only, plume hairs dark . *brunneus* Freeman
3. Antenna with apical rosette, abdomen of male white with segments 5, 8 and hypopygium black . . . . . *ephippium* sp. n.
   No apical rosette, abdomen not like this 4
4. Squama with fringe of about 6 hairs . . . . . *angustistilus* Freeman
   Squama with fringe of 1–3 hairs or bare 5
5. Cu_1 bent, L.R. only 0·4 . . . . . *brevitarsis* Freeman
   Cu_1 nearly straight, L.R. at least 0·7 6
6. Mesonotal stripes black, fused in male, anal point absent . . . *claviger* sp. n.
   Mesonotal stripes brown, separated in both sexes, short anal point present *biloba* Freeman

Nanocladius vitellinus Kieffer

Nanocladius vitellinus Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1**, 32.
Eukiefferiella (*Microcricotopus*) *niveipluma* Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 203 (SYN. NOV).

Examination of the holotype of *vitellinus* has shown that my species must fall as a synonym.

Male matt black with white antennal plumes, female more yellowish with separate scutal stripes; eyes densely pubescent, small pulvilli present, antennae with 10–12 long curved hairs at the apex in both sexes; belongs to the group previously known as *Microcricotopus* Thienemann and Harnisch.

Male. Wing length 1–1·3 mm.

Head black, face browner, mouthparts and scape black, flagellum paler, plumes quite white; flagellum with 13 segments, last segment clubbed and with about 10–12 long curved hairs on its apical half; A.R. 0·3–0·4; eyes densely hairy. *Thorax* completely black, scutum matt. *Legs* brownish, tarsi rather paler, L.R. 0·6, small pulvilli present. *Wings* milky white, venation as in Text-fig. 10, *a*, squama with 2–3 hairs; halteres yellowish or brown. *Abdomen* black, sometimes white basally, hairs often whitish, hypopygium as in Text-fig. 11, *a*, with narrow hairy anal point, coxite with inner lobe, style angled at apex though angle varies somewhat.

Female. Wing length 0·75–1·3 mm.

Face yellow, vertex brown, antennal segments 3–5 more or less oval, 6 equal to preceding three in length and somewhat clubbed, with a number of long white curved hairs as in male. Thorax yellowish and with three darker stripes which are well separated; scutellum brown, postnotum and sternopleuron blackish; legs and wings as in male, halteres pale, abdomen dark.

Holotype female of *vitellinus* in Muséum National d'Histoire Naturelle, Paris, type locality, Tanganyika, Kilimanjaro, Kilema, 4,500 ft.; holotype male of *niveipluma* in British Museum, type locality, Cape Province, Berg River, Piquetberg.

DISTRIBUTION. CAPE PROVINCE : series from various localities along Berg River (*K. M. F. Scott*). NATAL : 3 ♂, Mooi River, Rosetta, ix.1953 (*A. D. Harrison*). TRANSVAAL : 2 ♀, Tugela River, Colenso, ix.1953 (*A. D. Harrison*). BELGIAN CONGO : 2 ♂, 1 ♀, Parc Nat. Albert, Vitshumbi (Lake Edward), ii.1953 (*J. Verbeke*). UGANDA : 1 ♀, Lake Victoria (*W. W. Macdonald*). SUDAN : 3 ♂, 4 ♀, Wad Medani, ii.1952 (*D. J. Lewis*) ; 4 ♂, 3 ♀, Khartoum (*D. J. Lewis*) ; 2 ♂, 12 ♀, Wau, x.1952 (*E. T. M. Reid*) ; 2 ♂, Meroe, nr. Assuan (*S. Hirst*).

Nanocladius brunneus Freeman

Nanocladius brunneus Freeman, 1954, *Proc. R. ent. Soc. Lond.* (B) **23**, 175.

A small insect distinguishable from *vitellinus* by the yellowish brown thorax and shorter hairs at apex of antenna, the plumes of which are dark.

Male. Wing length 1·0 mm.

Head yellowish brown, palpi and antennae dark brown, plumes dark, A.R. about 0·3, apical segment slightly clubbed and with about 10 short, only slightly curved, hairs at the apex, not in the form of a rosette ; eyes densely hairy. *Thorax* yellowish with brown stripes ; postnotum and sternopleuron dark brown. *Legs* brown, pulvilli present, L.R. 0·6. *Wings* similar to *vitellinus*, halteres yellowish brown. *Abdomen* dark brown, hypopygium essentially similar to *vitellinus* (Text-fig. 10, *a*), anal point slightly shorter but this may be variable.

Female not known.

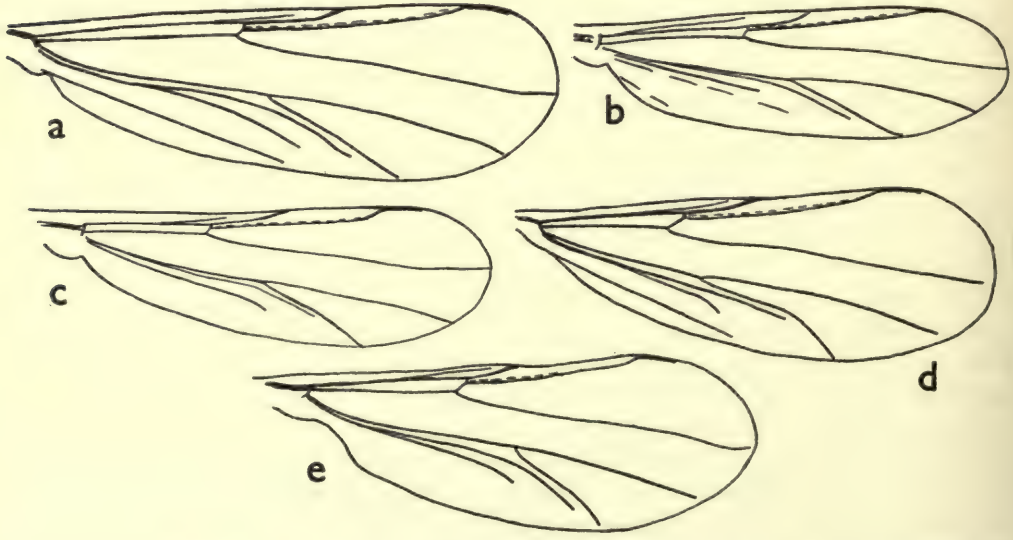

FIG. 10. Wings of male *Nanocladius*. (*a*) *N. vitellinus* ; (*b*) *N. claviger* ; (*c*) *N. ephippium* ; (*d*) *N. brevitarsis* ; (*e*) *N. biloba*.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE : holotype and 1 ♂ paratype, Berg River, Driefontein, iv.1953 (*K. M. F. Scott*). TRANSVAAL : 1 ♂, Great Usutu River, Amsterdam, ix.1954 (*A. D. Harrison*).

Nanocladius claviger sp. n.

Male with body quite black, thorax pruinose and slightly shining, female with separate stripes ; eyes bare, pulvilli absent, A.R. 0·5, squama with fringe of 2–3 hairs. Very similar to Palaearctic species *N. brevicalcar* Kieffer and *hospita* Edwards but antennae have different structure.

Male. Wing length 1·3 mm.

Head, mouthparts, antennae blackish, last segment of antenna clubbed, its apical third bare, A.R. about 0·5, flagellum with 13 segments, plumes dark ; eyes bare. *Thorax* black, slightly shining and pruinose ; when seen from the front pruinosity especially obvious on shoulders and prescutellar area. *Legs* brown, pulvilli absent, empodium as long as claws, L.R. 0·75. *Wings* (Text-fig. 10, *b*) with anal lobe better developed than in the other species, R_1 short, Cu_1 straight, posterior fork distal to r–m; squama with 2–3 hairs ; halteres whitish. *Abdomen* black, hypopygium (Text-fig. 11, *b*) lacking anal point, coxite lobe well formed, style simple.

Female. General body structure and wing venation similar to male ; shoulders pale, stripes narrowly separated, antennae with last segment nearly as long as three preceding ones.

Holotype male and 2 ♂, 4 ♀, NATAL : Drakensberg, Giant's Castle Camp, 5,000 ft. 18.ix.53 (*A. D. Harrison*) ; holotype in British Museum, 3 paratypes placed in South African Museum.

Nanocladius angustistilus Freeman

Eukiefferiella (*Eukiefferiella*) *angustistilus* Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 205.

A brownish species with no strong markings, hardly to be distinguished from the European *calvescens* Edwards, paler in colour, A.R. shorter, rather smaller. Antennae with short hairs at apex, halteres pale, squamal fringe well developed, empodium small ; male hypopygium characteristic.

Male. Wing length 1·3 mm.

Head yellowish brown, palpi and antennae darker, flagellum 13-segmented, A.R. 0·4, last segment with short hairs at apex ; eyes bare. *Thorax* yellowish brown with three dark brown more or less separate stripes, humeral pits rather large, postnotum and sternopleuron blackish. *Legs* pale brown, L.R. 0·7, pulvilli absent, empodium short. *Wings* milky, costa produced and ending above tip of M_{3+4}, R_1 and posterior fork as in *vitellinus*, An ending before fork ; squama with well developed fringe of about 6 hairs ; halteres pale. *Abdomen* brown, hypopygium (Text-fig. 11, *c*) with well developed bare anal point, inner lobe of coxite not very prominent ; style narrow with small inner flange and two apical spines, the smaller being transparent, IXth tergite bare.

Female. More yellow than male, scutal stripes pale brown, poorly defined; apical antennal segment with short hairs, rather longer than preceding two together.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE: holotype and 1 ♂, Berg River, Wellington, v and xii.1952; 1 ♂, 1 ♀, Berg River, French Hoek Forest Reserve, xi.1952; 1 ♂, Berg River, Cecilia's Drift, xii.1952 (all coll. *K. M. F. Scott*).

Nanocladius ephippium sp. n.

Male thorax black, abdomen yellow with segments 5 and 8 black, female brown with separate thoracic stripes; easily distinguished from all other African species known to me by the colour of the male and the presence of a rosette at the apex of the antenna in both sexes. Structurally hardly to be separated from the Palaearctic species *N. coronata* Edwards, but the colour suggests it is a different species.

Male. Wing length 1·0 mm.

Head, mouthparts, antennae brownish; scape black, plumes dark, flagellum with 13 segments, last segment short, A.R. only about 0·2–0·3, apical pubescence forming a rosette at the tip; eyes bare. *Thorax* black, slightly shining. *Legs* yellowish brown, pulvilli absent, L.R. 0·5. *Wings* (Text-fig. 10, *c*) with bare squama, Cu_1 with a trace of a bend, costa retracted, R_1 half as long as R_{4+5}; halteres whitish. *Abdomen* yellow, segments 5 and 8 and hypopygium black; hypopygium (Text-fig. 11, *d*) without anal point, coxite lobe right angled, style simple.

Female. Antennae with apical rosette as in male; scutum yellow with separate brown stripes, abdomen blackish, each segment paler along apical margin, in some specimens some segments are yellowish.

Holotype male and 16 ♂, 4 ♀ paratypes, NATAL: Mooi River, nr. Rosetta; other paratypes NATAL: 1 ♀, Mooi River, Kamberg Game Reserve; 1 ♂, Drakensberg, Giant's Castle Camp; 2 ♂, 1 ♀, Bushman's River, nr. Estcourt; 3 ♂, 1 ♀, Verdruk Dam, nr. Dundee (all coll. ix.1953, *A. D. Harrison*). TRANSVAAL: 1 ♂, 2 ♀, Pongola River, Pongola Settlements; 1 ♂, 2 ♀, Gladdespruit, nr. Badplaats (all coll. ix.1954, *A. D. Harrison*).

Nanocladius brevitarsis Freeman

Eukiefferiella (*Camptokiefferiella*) *brevitarsis* Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 205.

Readily distinguished from other species described here by the bent Cu and short L.R.; allied to the Palaearctic species *N. camptophleps* Edwards. Male black, female with separate scutal stripes; squama bare, anal point of male broad.

Male. Wing length 0·9 mm.

Head, mouthparts and scape black, flagellum brown with 11 segments, A.R. 0·4, apical antennal segment with short hairs at the tip; eyes bare. *Thorax* all black or very dark brown. *Legs* brown, empodium and pulvilli both absent, L.R. 0·4. *Wings* milky, venation as in Text-fig. 10, *d*; squama bare. Halteres yellow. *Abdomen* black, hypopygium (Text-fig. 11, *e*) with broad bare anal point, style evenly curved with no inner flange.

Female. Head and thorax with yellowish ground colour, mesonotal stripes dark brown and separate; postnotum, sternopleuron and abdomen brownish black; last antennal segment with short hairs on apical half and rather longer than preceding two together.

Holotype male in British Museum.

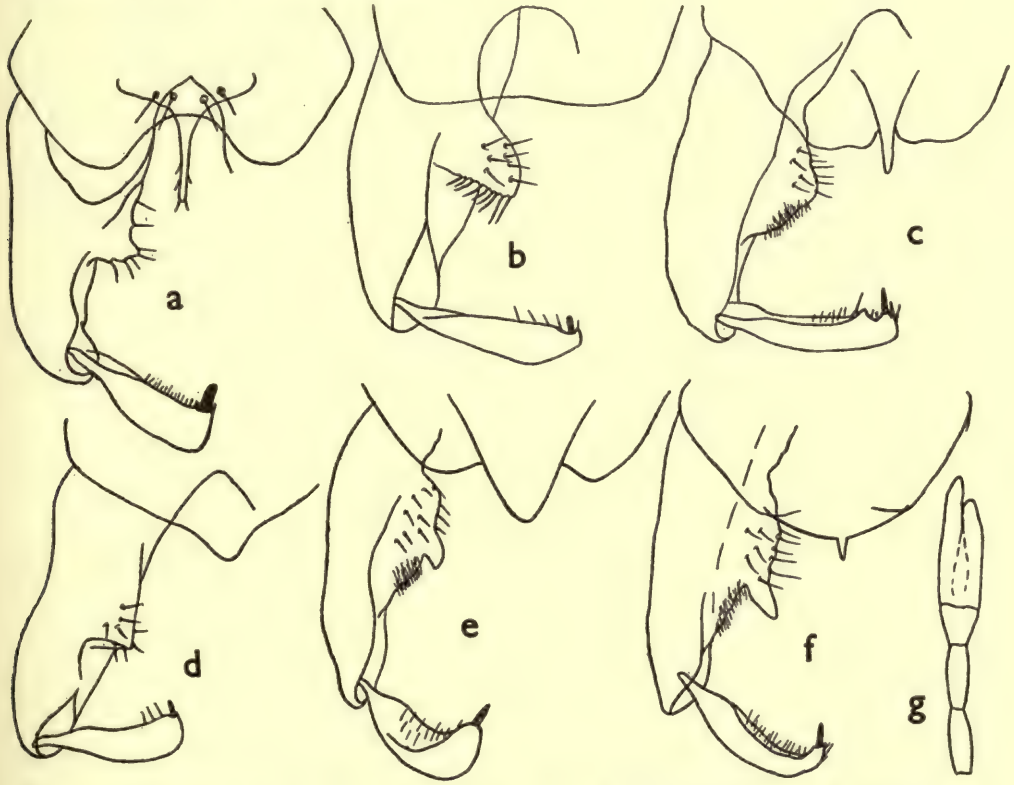

FIG. 11. Male hypopygia and male antennal apex of *Nanocladius*. (*a*) *N. vitellinus*; (*b*) *N. claviger*; (*c*) *N. angustistilus*; (*d*) *N. ephippium*; (*e*) *N. brevitarsis*; (*f*) and (*g*) *N. biloba*.

DISTRIBUTION. CAPE PROVINCE: type and 1 ♂, 1 ♀, Berg River, French Hoek, vii.1952; 1 ♂, 1 ♀, Berg River, Wellington, v.1952 and 9 ♂, 2 ♀, iv–v.1953; 1 ♂, Berg River, Piquetberg, ix.1952; 5 ♂, 1 ♀, Krom River, Stellenbosch, xii.1952 (all coll. *K. M. F. Scott*). NATAL: 1 ♂, Mooi River, Keate's Drift, iv.1954 (*W. D. Oliff*).

Nanocladius biloba Freeman

Eukiefferiella (*? Parakiefferiella*) *biloba* Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 205.

A minute insect with yellowish thorax and stripes. Last antennal segment of male short and appearing bilobed; vein R_{4+5} retracted, Cu_1 straight, squama with 0–2 hairs; anal point of male short.

Male. Wing length 1·0 mm.

Head, antennae and mouthparts brown, face sometimes yellow; eyes bare; flagellum with 12 segments, last segment short (Text-fig. 11, *g*) and bilobed at apex, penultimate segment short and forming part of the club; last segment with short hairs only. *Thorax* yellowish or brownish with three separate dark brown stripes; postnotum and sternopleuron dark brown or black. *Legs* pale brown, empodium well developed, pulvilli absent, L.R. 0·8. *Wings* slightly brownish, venation as in Text-fig. 10, *e*, costa and radius retracted, R_1 particularly short; squama either bare or with 1–2 hairs. Halteres brown. *Abdomen* brown; hypopygium (Text-fig. 11, *f*) with short anal point; shape of inner coxite lobe characteristic, style narrow and slightly bowed.

Female fairly uniform in colour, scutal stripes paler than in male; last antennal segment with short hairs, rather longer than preceding two together, not bilobed; legs and wings as in male.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE: holotype and 7 ♂, 9 ♀, paratypes, Berg River, French Hoek Forest Reserve, vii and x.1952 (*K. M. F. Scott*); 3 ♂, Kirstenbosch, iv.1952 (*K. M. F. Scott*). NATAL: 3 ♂, 3 ♀, Drakensberg, Tugela River, Royal Natal Nat. Pk., 5000 ft., ix.1953 (*A. D. Harrison*).

Genus ***LIMNOPHYES*** Eaton

Limnophyes Eaton, 1875, *Ent. mon. Mag.* **12**, 60; Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 354 (as subgenus of *Spaniotoma*); Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 204; Goetghebuer, 1944, in Lindner, *Flieg. Pal. Reg.* **3** (13g), 124.

Camptocladius van der Wulp, 1874, *Tidjschr. Ent.* **17**, 133 (in part); Kieffer, 1914, *Ann. S. Afr. Mus.* **10**, 261 (in part); Thienemann, 1921, *Arch. Hydrobiol. Suppl. Bd.* **2**, 809–50.

Eyes bare; wings with fine microtrichia clearly visible under a magnification of × 300, or even less, macrotrichia absent, anal lobe obtuse, squama with incomplete fringe of 2–6 hairs. Posterior fork well beyond r–m, R_{2+3} distinct from R_{4+5}, Cu_1 bent in the middle, fork wide; An ending about opposite fork, costa produced. Pulvilli absent, empodium as long as claws, tibiae without long hairs.

I am following Edwards (1929) in the definition of this group, but I prefer to treat it as a full genus because the easily seen microtrichia combined with the obtuse anal angle and bent Cu_1 make it distinctive. Only one African species is known to me, which has been described previously by Kieffer, Goetghebuer and myself.

Limnophyes natalensis Kieffer

Camptocladius natalensis Kieffer, 1914, *Ann. S. Afr. Mus.* **10**, 261.

Limnophyes brevis Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 203 (SYN. NOV.).

Limnophyes spinosa Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 206 (SYN. NOV.).

I have been able to borrow the holotype male of Kieffer's species and have found it to be an earlier description of my species *spinosa*. When I described *spinosa* I mentioned that Goetghebuer had described *brevis* from a mixed series including *spinosa* and that the type conformed to the other species. I have now been able to

examine his type series and can report that I was in error with regard to the identity of the type. Some specimens are faded and there are several specimens of other species in the series, including a species of *Metriocnemus*, which may account for Goetghebuer's statement that the shoulders were pale. This will also account for my error in 1953 because Dr. Benoit's examination rested largely on the colour of the thorax because Goetghebuer had not left a mount of the hypopygium.

The species is very close to *minima* Meigen from the Palaearctic Region and they may prove eventually to be identical. It is a little larger than *minima* and the antennal ratio is lower, segment 13 being three times as long as broad. Some of the specimens from the East African mountains have a higher A.R. and may either belong to a different species or may show that *natalensis* and *minima* are the same.

Male. Wing length 1·2–1·5 mm.

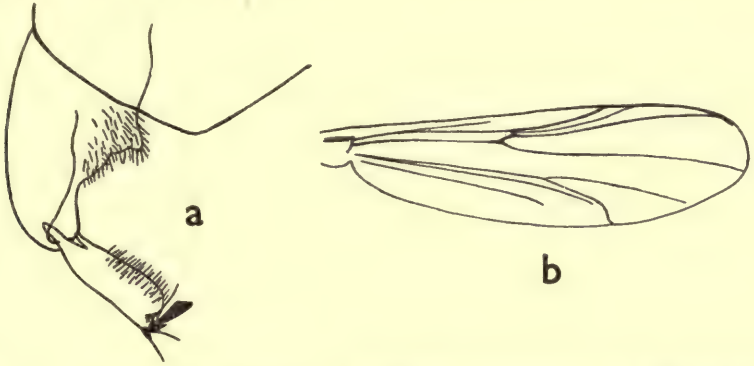

FIG. 12. *Limnophyes natalensis*. (*a*) Male hypopygium ; (*b*) wing of male.

Head, mouthparts and antennae black, plumes black, A.R. 0·3–0·5 in most specimens, though some E. African specimens have a ratio of 0·8 ; segment 13 three times as long as broad. *Thorax* entirely black, slightly shining and pruinose especially on prescutellar area, dorso-central bristles dark and uniserial, no scales present. *Legs* brown, trochanters yellowish, L.R. 0·5, empodium well developed, pulvilli absent. *Wings* (Text-fig. 12, *b*) with well developed microtrichia, slightly greyish by transmitted light, Cu_1 strongly curved, squama with 2–5 hairs. Halteres dark. *Abdomen* dark brown ; hypopygium (Text-fig. 12, *a*) without anal point, IXth tergite bare, style very similar to the Palaearctic species allied to *minima*, with inner margin bulbous, spine truncate and carried well at the apex.

Female quite similar to male.

Holotype male of *natalensis* in S. African Museum (Cape Province, Stellenbosch) ; holotype male and long series of paratypes of *brevis* in Musée Royal du Congo Belge (Belgian Congo, Kisantu); holotype male and paratypes of *spinosa* in British Museum (Cape Province, Kirstenbosch).

DISTRIBUTION. CAPE PROVINCE : series from Kirstenbosch, Assegaibos and Bergvliet (*K. M. F. Scott*). NATAL : 4 ♂, 2 ♀, Bushman's River, Estcourt, ix.1953 (*A. D. Harrison*). TRANSVAAL : 5 ♂, 3 ♀, nr. Johannesburg, iv.1955 (*A. D. Harrison*) ;

13 ♂, 12 ♀, Waterval, nr. Lydenburg iv.1955 (*A. D. Harrison*). S. RHODESIA: 5 ♂, Salisbury IV. 1956 (*E. T. M. Reid*). BELGIAN CONGO: series from Parc Nat. Albert (*de Witte* and *de Wulf*); 1 ♀, Elisabethville, iii.1939 (*H. J. Brédo*). UGANDA: 13 ♂, 5 ♀, Mt. Elgon, 9,500 ft., viii.1934 (*J. Ford*); 10 ♂, 5 ♀, Ruwenzori Range, Namwamba V., 13,500 ft., xii.1934 (*E. G. Gibbins*); 9 ♂, 2 ♀, Ruwenzori Range, Nyamgasani V., 11,000 ft., xii.1934 (*D. R. Buxton*); 4 ♀, Kigezi Prov., Mt. Muhavura, 13,500 ft., xi.1934 (*J. Ford*); 10 ♂, 2 ♀, Kigezi Prov., Mt. Sabinio, 11,000 ft., xi–1934 (*J. Ford*); 19 ♀, Kigezi Distr., Lake Mutamda, 6,000 ft., xi.1934 (*J. Ford*). KENYA: 1 ♂, Aberdare Range, Nyeri Track, 11,00 ft., x.1934 (*J. Ford*); 1 ♂, Aberdare Range, Mt. Kinangop, 10,000 ft., x.1934 (*F. W. Edwards*). SUDAN: 1 ♀, Helwan, iii.1923 (*S. Hirst*).

Genus *SMITTIA* Holmgren

Smittia Holmgren, 1869, *K. Svensk. Vet. Akad Handl.* **8**, 47; Goetghebuer, 1943, in Lindner, *Flieg. Pal. Reg.* **3** (13g), 77; Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 206.

Spaniotoma subg. *Smittia* Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 357.

Camptocladius van der Wulp, 1874, *Tijdschr. Ent.* **17**, 133 (in part); Kieffer, 1918, *Ann. Mus. Nat. Hung.* **16**, 76 (in part).

Allocladius Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1**, 28 (SYN. NOV.).

Phaenocladius Kieffer, 1921 in Thienemann, *Arch. Hydrobiol.* Suppl. **2**, 845.

Pseudosmittia Goetghebuer, 1932, *Faune de France* **32**, 126; Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 208.

Euphaenocladius Thienemann, 1934, *Encycl. Ent. Dipt.* **7**, 29.

Orthosmittia Goetghebuer, 1943, in Lindner, *Flieg. Pal. Reg.* **3** (13g), 110; Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 208.

Eyes bare or with very short pubescence; wings without distinguishable microtrichia, often rather milky; R_{2+3} ending separately in costa, posterior fork well beyond cross-vein, Cu often strongly curved; squama always quite bare; pulvilli usually absent.

The small species falling into this genus are best distinguished by the bare squama, a feature not found elsewhere except for occasional species of *Nanocladius* which can easily be separated on venational characters. I prefer to treat the group as a full genus and not to follow Edwards (1929) and treat it as a subgenus.

Edwards subdivided the British species of his subgenus *Smittia* into five species groups using as the key character the length of the anal vein. Goetghebuer (1943) made certain alterations to this arrangement and called the groups subgenera of the genus *Smittia*. The African species resemble Palaearctic species to a greater or lesser extent, but they do not all conform exactly to the grouping used by either Edwards or Goetghebuer, probably because the venational characters show more variety in the African species. The largest number of the species falls into Group E of Edwards, two species fall into Group A and three into Group D. There are others that do not seem to fall into any of the groups.

Goetghebuer took the species of Groups D and E together and redivided them as subgenera on the basis of the shape of Cu, whether it was straight or bent, calling them *Orthosmittia* and *Pseudosmittia* respectively. I am not very satisfied with this

grouping because it seems to place dissimilar species together, also *Orthosmittia* includes very few species.

I am of the opinion that Edwards' classification offers a basis for recognizing species groups, but that overlap and anomalous species blur the outlines of the groups. I do not, therefore, propose to recognize any subgenera and I am only using the species grouping of Edwards where possible to place the species that seem to be allied next to each other.

There is some evidence of a group not recognized by either Edwards or Goetghebuer, of species with a transverse fold beyond the end of the anal vein which gives the appearance of a spurious second posterior fork. This is also shown by at least six British species: *brevifurcata* Edwards, *trilobata* Edwards, *curticosta* Edwards, *conjuncta* Edwards, *forcipata* Goetghebuer, *contingens* Walker and by the Japanese species *bifurcata* Tokunaga. This group cuts across *Orthosmittia* and *Pseudosmittia* and is more favourable to Edwards' Groups.

Allocladius Kieffer, a genus described from an East African specimen said to be intermediate between the Orthocladiinae and Chironominae is an earlier description of *Pseudosmittia salti* Freeman. It has the coxite lobe in two well-formed free parts.

Euphaenocladius Thienemann has the same type species as *Phaenocladius* Kieffer and must fall as a synonym.

Kieffer described four species from Seychelles and five from the mainland which seem to be best placed in *Smittia* as shown in Table I (p. 292). I have seen the type of one mainland species but not of the other four, which were described from females. Of these, *Camptocladius guineensis* and *longicosta* both appear to be earlier descriptions of *Smittia longicostalis* Goetghebuer; *C. capensis* and *kribiensis* are unrecognizable, but probably belong to *Smittia*. Notes on these two are given below. Goetghebuer has described two species in *Smittia*, one being a redescription of a Kieffer species.

Key to African species of *Smittia*

(Includes only species of which I am certain and have seen specimens; based on males but can be used for some females.)

1. Eyes pubescent, anal vein reaching beyond fork 2
   Eyes bare, anal vein not reaching beyond fork 4
2. Wings with heavy dark markings (Text-fig. 13, *c*) . . . *maculipennis* Goetghebuer
   Wings plain 3
3. Anal lobe distinct in male (Text-fig. 13, *a*) . . . . . *atra* Freeman
   Anal lobe obtuse . . . . . *fletcheri* sp. n.
4. Wings with an extra transverse fold beyond apex of anal vein, running from Cu_2 towards wing margin, forming an accessory posterior fork 5
   Wings without this fold 8
5. Cu_1 strongly bent or curved (Text-figs. 13, *m*, *n*) 6
   Cu_1 practically straight (Text-figs. 13, *k*, *l*) 7
6. A.R. 1·1, halteres black, costa longer (Text-fig. 13, *m*), hypopygium as in Text-fig. 14, *l* *subtrilobata* sp. n.
   A.R. 0·8, costa shorter, halteres white, hypopygium as in Text-fig. 14, *m*. *hamata* sp. n.
7. Shoulders of male with brilliant silvery pruinosity . . *melanostola* Kieffer
   Thorax of male all black . . . . . *hirtella* Freeman

8. Wings with anal lobe well formed in male, costa not produced 9
   Wings without anal lobe in male 11
9. Anal lobe very distinct (Text-fig. 13, *e*), coxite lobe right-angled . *rectilobus* Freeman
   Anal lobe less distinct 10
10. Coxite lobe very large and free (Text-fig. 13, *d*) wings smoky in both sexes *nigra* Kieffer
    Coxite lobe small and not free (Text-fig. 13, *f*) wings not smoky . . *conigera* Freeman
11. Anal vein strongly curved at apex, almost reaching wing margin (Text-fig. 13, *i*), male style as in Text-fig. 14, *h* . . . . . *wulfi* sp. n.
    Anal vein only slightly curved at apex 12
12. Body yellow with black markings on stripes and abdominal segments 2, 3, 5 and 8 *harrisoni* sp. n.
    Body black, though abdominal sternites sometimes paler 13
13. R_{4+5} ending at level of apex of M_{3+4} 14
    R_{4+5} ending before this level 15
14. Thorax brown and not very shining, species from Seychelles . . *mahensis* Kieffer
    Thorax black and slightly shining . . . . . *subnigra* nom. nov.
15. A.R. only about 0·2, anal point long, ♀ not known . . . *capicola* Freeman
    A.R. 0·7, anal point absent; costa of female greatly produced, antennae with flask-shaped segments . . . . . *guineensis* Kieffer

Smittia atra Freeman

Smittia atra Freeman, 1954, *Proc. R. ent. Soc. Lond.* (B) **23**, 175.

A typical member of Edwards' Group B, doubtfully distinct from the Palaearctic species *aterrima* Meigen, style without such a large projection. Quite black, thorax rather shining, eyes with short pubescence, costa produced, Cu_1 bent, anal lobe distinct, female antennae with intermediate segments moniliform.

Male. Wing length 1·8 mm.

Head, mouthparts, and antennae black, A.R. about 1·5, eyes with distinct but short pubescence. *Thorax* all black, slightly shining and with some pruinosity. *Legs* dark brown, L.R. 0·6, pulvilli absent, empodium well developed. *Wings* milky, venation as in Text-fig. 13, *a*, costa clearly produced, r–m short, Cu_1 bent, An reaching beyond posterior fork, anal lobe distinct but not large. Halteres dark brown. *Abdomen* blackish, hypopygium (Text-fig. 14, *a*) with bare anal point, IXth tergite with a few hairs, style with inner flange present but less developed than in *aterrima* Meigen.

Female similar to male, antennae with intermediate segments moniliform.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE: type series, Berg River, iv–v.1953 (*K. M. F. Scott*). BELGIAN CONGO: 1 ♂, Lulenga (*de Wulf*) in Musée Royal du Congo Belge. UGANDA: 1 ♂, Kigezi Distr., Lake Mutamda, 6,000 ft., xi.1934 (*J. Ford*); 1 ♂, Kigezi Prov., Mt. Sabinio, 11,500 ft., xi.1934 (*J. Ford*). ETHIOPIA: 15 ♂, 16 ♀, Addis Ababa, iv.1936 (*J. W. S. Macfie*).

Smittia fletcheri sp. n.

Eyes pubescent; body entirely black, squama and halteres white; anal lobe of wing rounded and obtuse; male hypopygium characteristic. Similar to *atra* but easily separated by shape of male style and anal point, also by reduced wing lobe; it belongs to Edwards' Group B although it is not completely typical.

Male. Wing length 1·5 mm.

Head, mouthparts, antennae and plumes black, eyes with short but distinct pubescence, A.R. about 1·4. *Thorax* black, not as shining as *atra*, pruinose. *Legs* dark brown, L.R. 0·6, pulvilli absent, empodium present. *Wings* whitish, squama white, anal lobe reduced (Text-fig. 13, *b*), venation very similar to *atra*. Halteres white. *Abdomen* blackish, hypopygium (Text-fig. 14, *b*) with broad, bare anal point and well formed coxite lobe ; style with broad median expansion giving a triangular appearance.

Female not known.

Holotype male UGANDA : Ruwenzori Range, Mahoma River, 6,700 ft., viii.1952 (*D. S. Fletcher*) in British Museum.

Smittia maculipennis Goetghebuer

Smittia maculipennis Goetghebuer, 1936, *Rev. Zool. Bot. Afr.* **28**, 492.

Readily distinguished from all other African species known to me by the heavy bluish black markings on the wings ; eyes pubescent, anal vein extending just beyond fork, placing it in Edwards' Group B.

Male not known.

Female. Wing length 1·0 mm.

Head black, antennae rather paler, segments 3–5 oval, 6 nearly as long as 4–5 together, eyes with short pubescence. *Thorax* velvety black or dark brown. *Legs* yellowish brown, pulvilli absent, L.R. 0·5. *Wings* (Text-fig. 13, *c*) heavily marked with bluish black as shown ; Goetghebuer's figure is inaccurate, because the anal spot is not discrete, but has a ragged edge and is hardly separated from the main spot ; in some specimens the two are fused ; costa strongly produced, Cu_1 bent, An ending just beyond fork. Halteres white. *Abdomen* black.

I have seen the holotype female which is in Musée Royal du Congo Belge.

DISTRIBUTION. BELGIAN CONGO : holotype, N. Kivu, Kibati, xi–xii.1933 (*de Wulf*) ; 2 ♀, Envir. Mission Rugari, Lulenga (*de Wulf*) in Mus. R. du Congo Belge ; 1 ♀, Elizabethville, xii.1938 (*H. J. Brédo*) in Inst. R. des Sciences naturelles de Belgique. KENYA : 6 ♀, Muguga, x.1953 (*V. F. Eastop*).

Smittia nigra Kieffer

Allocladius niger Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1**, 28.
Pseudosmittia salti Freeman, 1954, *Arch. Hydrobiol.* **48**, 442 (SYN. NOV.).

In his original description Kieffer states that the anal point was absent. I have been able to examine the type and can say that a broad anal point is present.

Completely black, eyes bare, wings smoky especially in female, costa not produced, Cu_1 slightly bent, An not reaching beyond fork ; male coxite lobes long and free ; falls into Edwards' Group D.

Male. Wing length 1·5–1·6 mm.

Head, mouthparts and antennae black, A.R. 0·9, eyes bare. *Thorax* black, slightly pruinose, hardly shining, bristles black . *Legs* black and with black hairs, L.R. 0·5, pulvilli absent, empodium well developed. *Wings* (Text-fig. 13, *d*) rather dark,

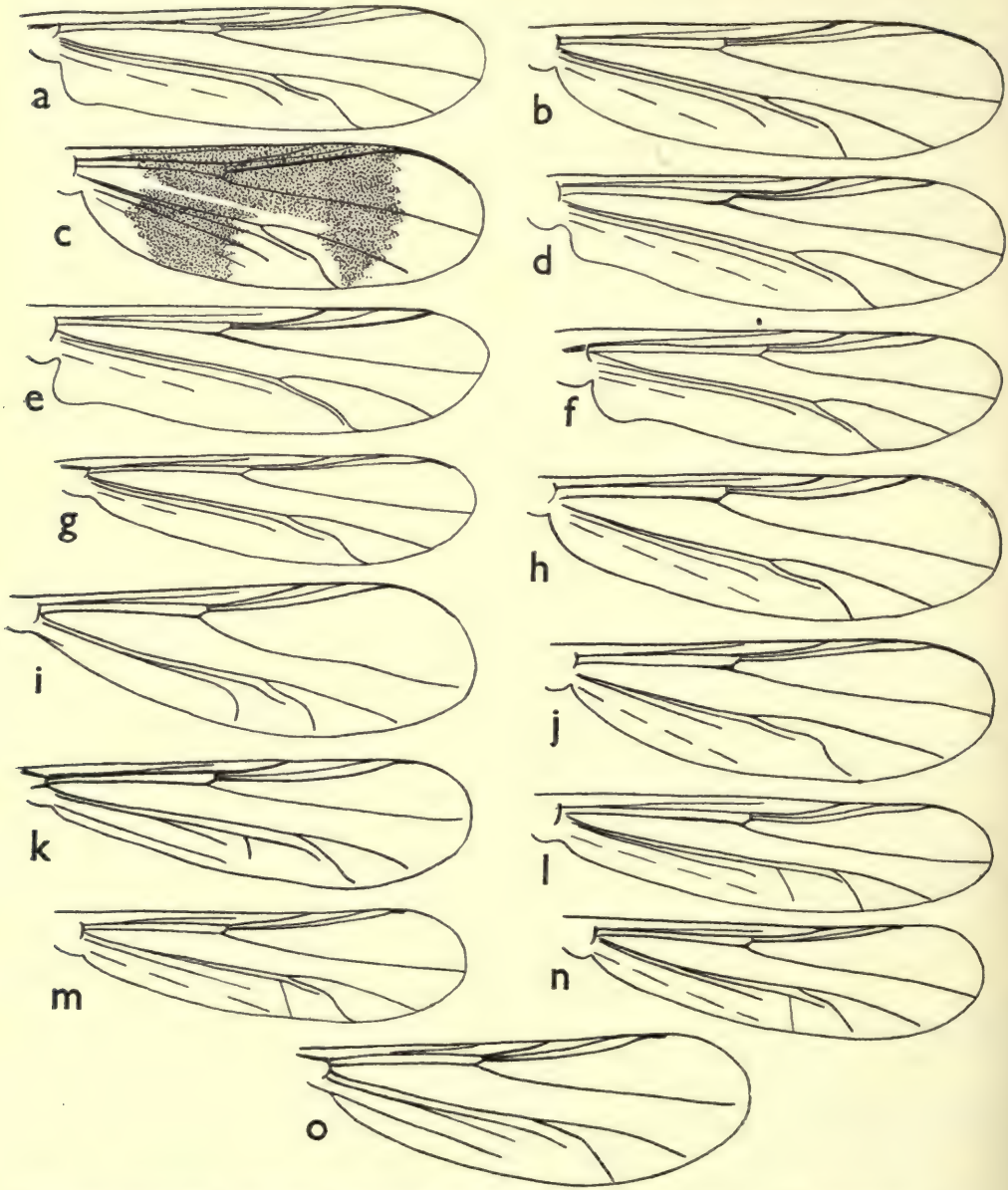

FIG. 13. Wings of *Smittia*, all males except for (*c*). (*a*) *S. atra*; (*b*) *S. fletcheri*; (*c*) *S. maculipennis*; (*d*) *S. nigra*; (*e*) *S. rectilobus*; (*f*) *S. conigera*; (*g*) *S. subnigra*; (*h*) *S. guineensis*; (*i*) *S. wulfi*; (*j*) *S. harrisoni*; (*k*) *S. hirtella*; (*l*) *S. melanostola*; (*m*) *S. subtrilobata*; (*n*) *S. hamata*; (*o*) *S. capicola*.

greyish or slightly smoky, costa not produced, Cu slightly bent, An ending just before or oppposite fork, lobe present but not large. Halteres black. *Abdomen* black; hypopygium (Text-fig. 14, *c*) with well developed hairy anal point arising rather basally on tergite which has a few hairs; inner lobe of coxite in two parts, lower one free and large. In the holotype of *salti* the lower lobe is broad and racket-shaped but there is some variation in the exact, shape and other specimens may have it a good deal narrower.

Female very similar to male, segments 3–5 of antenna oval, last segment equal to two preceding together; wings darker, quite dark grey in one specimen, costa longer, possibly slightly produced; ending beyond apex of M_{3+4}.

Holotype male of *nigra* in Muséum National d'Histoire Naturelle, Paris; of *salti* in British Museum.

DISTRIBUTION. KENYA: holotype male of *nigra*, Mt. Kenya, 2870 m., i.1912 (*Alluaud et Jeannel*); paratype males of *salti*, Aberdare Range, Nyeri Track, 10,500–11,000 ft., x.1934 (*J. Ford*). UGANDA: 1 ♂, Kigezi Distr., Lake Mutanda, 6,000 ft., xi.1934 (*J. Ford*). TANGANYIKA: holotype male and paratype female of *salti*, Kilimanjaro, Shira Plateau, 12,100 ft., xi.1948 (*G. Salt*). BELGIAN CONGO: 1 ♀, Parc Nat. Albert, Nyiragongo, 2,300 m. (*de Wulf*) in Mus. Roy. du Congo Belge.

Smittia rectilobus Freeman

Pseudosmittia rectilobus Freeman, 1955, *S. Afr. Animal Life*. Uppsala, **2**, 252.

Body completely black, halteres black, costa not produced, Cu bent, An ending opposite fork, anal lobe of wing large. Falls into Edwards' Group D.

Male. Wing length 1·5 mm.

Head black, eyes bare, plumes dark, A.R. about 1·7. *Thorax* black and slightly shining *Legs* dark brown, L.R. 0·6. *Wings* (Text-fig. 13, *e*) milky, lobe prominent, costa not produced, Cu_1 slightly bent. Halteres blackish. *Abdomen* black; hypopygium (Text-fig. 14, *d*) quite characteristic; anal point short and hairy basally, inner coxite lobe right-angled or slightly more produced; style somewhat bent upwards at apex.

Female not known.

Holotype male in South African Museum, Cape Town.

DISTRIBUTION. CAPE PROVINCE: holotype ♂, and 14 ♂ paratypes, Stellenbosch, x.1917 (*Lightfoot*); 7 ♂ paratypes Cape Peninsular xi.1950 (*P. Brinck*). TRANSVAAL: 1 ♂, Assegai River, ix.1953 (*A. D. Harrison*); 1 ♂ Pongola Settlements ix.1954 (*A. D. Harrison*); 1 ♂, Amsterdam, Gt. Usutu River, ix.1954 (*A. D. Harrison.*) S. RHODESIA: 1 ♂, Salisbury, IV. 1956 (*E. T. M. Reid*). UGANDA: 1 ♂, Kigezi Distr., Mt. Mgahinga, 11,000 ft., xi.1934 (*F. W. Edwards*); 1 ♂, Mt. Elgon, 8,000 ft., viii.1934 (*J. Ford*).

Smittia conigera Freeman

Pseudosmittia conigera Freeman, 1954, *Proc. R. ent. Soc. Lond.* (B) **23**, 176.

Entirely black or dark brown, thorax slightly shining, costa not produced, posterior fork rather wide, Cu slightly bent, An short, anal lobe present. Falls into Edwards'

Group D, best separated from previous two species by shape of coxite lobes of male.

Male. Wing length 1·5 mm.

Head, mouthparts and antennae black, A.R. about 1·6, eyes bare. *Thorax* black, slightly shining and pruinose. *Legs* dark brown, L.R. 0·5 ; pulvilli absent, empodium well developed. *Wings* (Text-fig. 13, *f*) milky ; costa not produced, posterior fork fairly short and wide, Cu slightly bent, An not reaching fork ; anal lobe well marked. Halteres black. *Abdomen* blackish, hypopygium (Text-fig. 14, *e*) with widely conical and short anal point, IXth tergite and point with scattered hairs, style rather foreshortened in the figure and with slight inner flange, coxite lobe small.

Female very similar to male, as in *nigra* the costa is longer ; distinguished from *nigra* by the paler wings.

Holotype male in British Museum, type locality, Cape Province, Berg River, Piquetberg.

Distribution. Cape Province : type series (4 ♂), Berg River, xii.1952–iii.1953 (*K. M. F. Scott*). Natal : 1 ♂, Bushman's River, ix.1953 (*A. D. Harrison*). Transvaal : 2 ♂, Olifants River, Loskoop Dam, v.1955 (*A. D. Harrison*). Belgian Congo : 13 ♂, 2 ♀, Parc Nat. Albert xii.1934–i.1935 (*de Witte*) ; 1 ♂, Lulenga (*de Wulf*) in Mus. Roy. du Congo Belge. Ethiopia : 9 ♂, nr. Addis Allem, *c*, 8,000 ft., ix.1926 (*J. Omer Cooper*) ; 1 ♂, Koram, iii.1936 (*J. W. S. Macfie*).

Smittia subnigra nom. nov.

Smittia nigra Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 206 (not Kieffer, 1913—see above).

This species does not fit easily into any of Edwards' groups. It cannot be placed in Group B because of the shortness of the anal vein and is precluded from D by the produced costa and absence of anal lobe ; the conformation of the costa is unlike Group E.

Quite black in both sexes ; A.R. about 1·3, L.R. 0·75 ; costa produced, Cu bent, anal lobe absent ; anal point of male short and hairy.

Male. Wing length 1·1–1·4 mm.

Head, mouthparts and antennae with plumes black ; eyes bare, A.R. 1·3. *Thorax* quite black, slightly shining and with some pruinosity. *Legs* dark brown or blackish, L.R. about 0·75, pulvilli absent. *Wings* (Text-fig. 13, *g*) milky, costa well produced, posterior fork beyond r–m, Cu bent, An ending slightly before fork, anal angle obtuse. Halteres black. *Abdomen* black ; hypopygium (Text-fig. 14, *f*) with short rounded and hairy anal point, IXth tergite with some hairs immediately around anal point ; coxite with small inner lobe, style rather curved and without flange.

Female. There are some specimens doubtfully determined as this species : very similar to male, but with costa strongly produced, much more so than in male ; antenna with intermediate segments fusiform, last segment one and a half times as long as penultimate.

Holotype male in British Museum.

Distribution. Cape Province : holotype ♂, 2 ♂ paratypes x.1952 and 5 ♂, v.1953, Berg River, French Hoek Forest Reserve ; 3 ♀, Bergvliet, x.1952 (all coll. *K. M. F. Scott*).

Smittia mahensis Kieffer

Dactylocladius mahensis Kieffer, 1911, *Trans. Linn. Soc. Lond.* (*Zool.*) **14**, 361.

Described from a single male gummed on its side on to a piece of card. It is now lacking one wing and the hypopygium ; the other wing is gummed down and is partly hidden by the other parts of the specimen. The following description is as complete as possible, but more material will be necessary from the type locality before a full diagnosis can be given. Kieffer's figure of the hypopygium is diagrammatic and useless for recognition purposes ; he did not preserve the mount.

A brownish black insect with paler shoulders (? faded), costa produced, R_{4+5} ending at same level as M_{3+4} ; An ending just before posterior fork. It does not fit readily into any of Edwards' groups.

Male. Wing length about 1·0 mm.

Head, mouthparts, antennae brownish yellow, eyes bare, A.R. 0·9, antennae with 13 or 14 segments, not 12 as stated by Kieffer. *Thorax* brown, shoulders yellowish. *Legs* brownish, pulvilli absent, anterior tarsi broken. *Wings* pale, squama bare, anal angle rounded, similar to *fletcheri* (Text-fig. 13, *b*) ; venation very similar to that species except that r–m is longer and anal vein ends just before the fork. Halteres pale. *Abdomen* dark brown, hypopygium missing and impossible to describe from Kieffer's figure.

Holotype male in British Museum.

Distribution. Known only from the type, Seychelles : Mahé, Anonyme I., i.1909 (*J. S. Gardiner*).

Smittia guineensis Kieffer

Camptocladius guineensis Kieffer, 1918, *Ann. Mus. nat. Hung.* **16**, 81.
Camptocladius longicosta Kieffer, 1923, *Ann. Soc. ent. France* **92**, 185 (syn. nov.).
Smittia longicostalis Goetghebuer, 1934, *Rev. Zool. Bot. Afr.* **25**, 204 (syn. nov.).

All three species synonymized here were described from the female. This species is peculiar in the female because of the unusual length of the antennae with their flask-shaped segments, also the costa is greatly produced and R_{4+5} ends basal to the level of the tip of M_{3+4}. All these points are mentioned in Kieffer's descriptions and I am quite satisfied that they are both earlier descriptions of Goetghebuer's species, of which I have seen the type. Kieffer states that in *longicosta* the stripes are separate, but spirit specimens are usually much paler than pinned ones. I am fairly certain that I have been able to identify the male, even though the costa is not clearly produced, because of the width of the radial cell and the general appearance. I have examined the single remaining type specimen of *longicostalis* and am unable to see the pubescent eyes mentioned by Goetghebuer, who also overestimated the leg ratio.

Thorax matt black, eyes bare, A.R. 0·7 ; costa not clearly produced in the male, strongly produced in the female, Cu_1 bent, anal vein ending opposite fork, anal lobe reduced ; female antenna with flask-shaped intermediate segments. It seems to fall between Groups D and E of Edwards' classification.

Male. Wing length 1·1 mm.

Head and mouthparts black, pedicel black, flagellum and plumes whitish, A.R. 0·7, eyes bare. *Thorax* matt black, mesonotum rather browner centrally. *Legs* pale brown, pulvilli absent, L.R. 0·4. *Wings* very glassy in appearance, anal lobe obtuse (Text-fig. 13, *h*) ; costa not clearly produced, but wing margin slightly thickened as shown ; R_1 and R_{4+5} widely separated, the latter ending just basal to M_{3+4}, Cu_1 bent, An ending opposite fork. Halteres brownish yellow. *Abdomen* black ; hypopygium (Text-fig. 14, *g*) simple, IXth tergite lacking point but hairy at apex, coxite lobe reduced, style curved.

Female dark brown, matt, distinguished from other African species known to me by the longer antennae, segments 2–5 being flask-shaped, 3–5 with stem as long as basal bulb, 6 as long as 4 and 5 together. Wings slightly brown tinged, costa strongly produced for the distance of the slight thickening of the male, remainder of venation as in male.

I have seen the holotype female of *longicostalis* in Musée Royal du Congo Belge. The type specimen of *guineensis* was not preserved by Kieffer with the remainder of the collection described at the same time, and together with that of *longicosta* must be presumed lost.

Distribution. French Guinea : Mamon (type locality of *guineensis*). French Cameroons : Kribi (type locality of *longicosta*). Belgian Congo : type ♀ of *longicostalis*, Kisantu ; 1 ♀, Rutshuru, i.1934 (*de Wulf*) ; 1 ♂, 5 ♀, Envir. Mission Rugari, Lulenga (*de Wulf*) ; 1 ♀, Parc Nat. Albert, cratère Muganga (*de Wulf*)—all from coll. of Musée Royal du Congo Belge.

Smittia wulfi sp. n.

Distinguished from all other African species known to me by the long strongly curved anal vein which nearly reaches the wing margin basal to level of posterior fork. Costa strongly produced, style of male hypopygium with two rows of bristles, palpi reduced, A.R. 0·4 ; it does not fit easily into any of Edwards' Groups.

Male. Wing length 1·0 mm.

Head brown, mouthparts yellowish, palpi reduced, each segment about one and a half times as long as broad, eyes bare. Antennal plumes reduced in number, free segments fusiform, apical segments short so that A.R. is only about 0·4. *Thorax* brown, shoulders yellow. *Legs* yellowish, L.R. 0·5, pulvilli absent. *Wings* (Text-fig. 13, *i*) clear, anal lobe absent, An long and curved, nearly reaching wing margin but not passing posterior fork, costa strongly produced, Cu bent. Halteres brownish. *Abdomen* dark brown, hypopygium very characteristic (Text-fig. 14, *h*) ; anal point absent, represented by a small hairy lobe, coxite lobes as shown, the more apical one with a small tuft of curved hairs ; style with a basal group of strong hairs or bristles and a row of smaller ones along its length.

Female not known.

Holotype male Belgian Congo : Envir. Mission Rugari, Lulenba, 1933 (*de Wulf*) in Musée Royal du Congo Belge.

Smittia harrisoni sp. n.

A distinctive species, yellow with dark markings on thorax and on abdominal segments 2, 3, 5 and 8 ; A.R. 0·6, eyes bare, costa produced, Cu bent, An short, anal lobe absent, knees black. It presumably falls into Edwards' Group E.

Male. Wing length 1·1 mm.

Head and mouthparts yellow, antennae brownish, A.R. 0·6, eyes bare. *Thorax* yellow with brown markings forming a circle around prescutellar area, i.e. two small marks on central stripes, lateral stripes largely brown, wing bases and base of scutellum brown, postnotum dark. *Legs* yellow, apices of femora, bases and apices of tibiae black, pulvilli absent, L.R. 0·75. *Wings* dark basal to arculus, costa strongly produced (Text-fig. 13, *j*), Cu_1 well bent, An short, anal lobe obtuse. Halteres yellow. *Abdomen* yellow, segments 2, 3, 5 with apical third and lateral margins black, segment 8 wholly black. Hypopygium simple (Text-fig. 14, *i*). anal point broad and bare, coxite lobe small, style without flange.

Female with coloration similar to male except for abdomen, which is darker with pale areas less conspicuous ; antennal segments 3–5 fusiform.

Holotype male and 6 ♂, 1 ♀, paratypes, TRANSVAAL : Mica-Gravellotte Road, 6.v.55 ; 1 ♂, Kruger National Park, Skukuza, Sabie River, 5.v.55 (*A. D. Harrison*). SUDAN : 3 ♂, 1 ♀, Wau, x.1952 (*E. T. M. Reid*). Holotype and 9 paratypes in British Museum, 3 paratypes placed in South African Museum.

Smittia hirtella Freeman

Orthosmittia hirtella Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 208.

A small species, male all black, female more yellowish with separate black scutal stripes ; transverse fold present beyond apex of anal vein, posterior fork short, Cu_1 straight ; the only other African species known to me with straight Cu_1 comes from Seychelles (*melanostola*). This species falls into Edwards' Group E and *Orthosmittia* Goetghebuer.

Male. Wing length 1·0 mm.

Head and pedicel black, palpi and flagellum brown, plumes black, A.R. about 0·9, eyes bare. *Thorax* black. *Legs* brown, empodium well developed, pulvilli absent, L.R. 0·5. *Wings* milky, venation as in Text-fig. 13, *k*, costa produced, R_{4+5} ending before level of apex of M_{3+4}, posterior fork short and distal, Cu_1 straight ; An short, transverse fold present giving appearance of double posterior fork, but not as well developed as in *melanostola* ; anal lobe absent. Halteres black. *Abdomen* black ; hypopygium (Text-fig. 14, *j*) with long bare anal point, inner lobe of coxite nearly right-angled.

Female. Smaller than male, wing length 0·7–0·8 mm. Head, scape, mouthparts yellowish, flagellum brown ; last antennal segment equal to preceding two together. *Thorax* yellowish, mesonotum with three separate dark brown stripes, postnotum and sternopleuron dark brown. Costa more strongly produced, abdomen black on tergites, sternites pale, cerci brown.

Holotype male in British Museum.

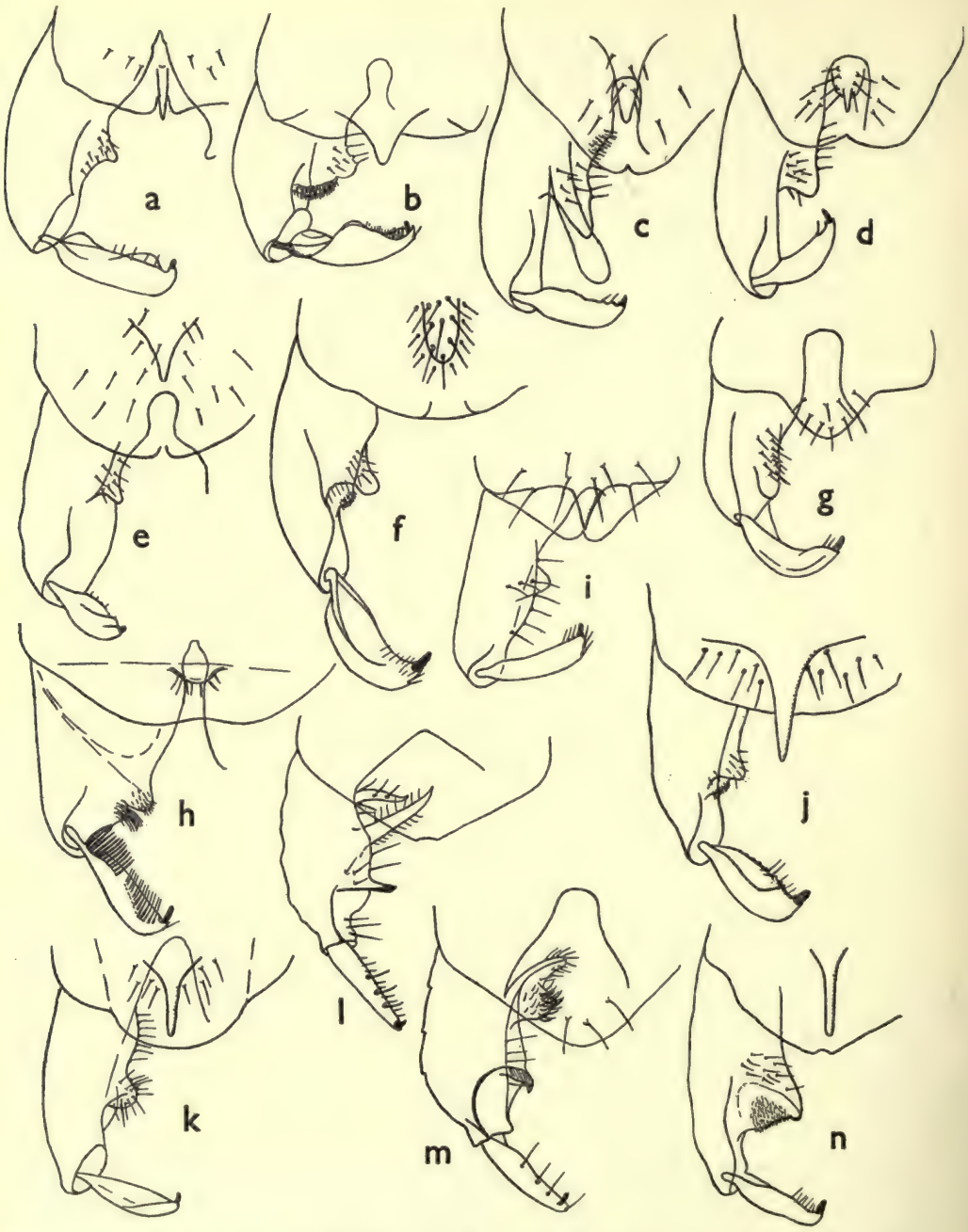

FIG. 14. Male hypopygia of *Smittia*. (*a*) *S. atra*; (*b*) *S. fletcheri*; (*c*) *S. nigra*; (*d*) *S. rectilobus*; (*e*) *S. conigera*; (*f*) *S. subnigra*; (*g*) *S. guineensis*; (*h*) *S. wulfi*; (*i*) *S. harrisoni*; (*j*) *S. hirtella*; (*k*) *S. melanostola*; (*l*) *S. subtrilobata*; (*m*) *S. hamata*; (*n*) *S. capicola*.

DISTRIBUTION. CAPE PROVINCE: holotype male and 1 ♂, 3 ♀, Zeekoe Vlei, xi.1952 (*K. M. F. Scott*). TRANSVAAL: 1 ♂, Nelspruit, Crocodile River, ix.1954 (*A. D. Harrison*). NATAL: 2 ♂, mouth of Tugela River, v.1954 (*W. D. Oliff*). NYASALAND: 1 ♂, Mlanje, v.1913 (*S. A. Neave*).

Smittia melanostola Kieffer

Dactylocladius melanostolus Kieffer, 1911, *Trans. Linn. Soc. Lond.* (*Zool.*) **14**, 362.
Dactylocladius xanthostolus Kieffer, 1911, *Ibid.*, 362 (SYN. NOV.).
Dactylocladius heterostolus Kieffer, 1911, *Ibid.*, 363 (SYN. NOV.).

Structure quite similar to *hirtella*, but easily distinguished by the brilliant silvery pruinose shoulders of the male; wings brown tinged, white basal to arculus, A.R. 1·0. The females were described by Kieffer as two separate species, but their wing venation and general appearance show them to be not only the same species as each other but also the same as the males. He is wrong in saying that the anterior tibia of *heterostolus* is only one and a half times as long as the basitarsus: measurements show it to be exactly twice as long, which is the ratio he gives for *xanthostolus*.

Male. Wing length 1·3 mm.

Head, mouthparts and antennae dark brown, eyes bare, A.R. about 1·0. *Thorax* dark brown, matt, shoulders yellow and with brilliant silvery pruinosity. *Legs* yellowish brown, pulvilli absent, L.R. 0·75. *Wings* slightly brown tinged, white basal to arculus, venation (Text-fig. 13, *l*) quite similar to *hirtella*, but costa more produced, posterior fork shorter, accessory fork better developed. *Abdomen* dark brown; hypopygium (Text-fig. 14, *k*) again quite similar to *hirtella*, anal point smaller, style narrower.

Female. Shoulders lacking pruinosity, antennae with segments 3–5 slightly flask-shaped, last segment rather longer than preceding two together, otherwise quite similar to male.

Type specimens of all three species in British Museum.

DISTRIBUTION. Known only from type locality, SEYCHELLES: Mahé; 3 ♂, *melanostolus*, Cascade Estate iii.1909; 3 ♀ *xanthostolus* and 1 ♀ *heterostolus* Anonyme I., from seaweed, i.1909.

Smittia subtrilobata sp. n.

This species is hardly to be distinguished from the Palaearctic species *trilobata* Edwards. The differences lie in the greater reduction of anal lobe, the clearer wings, the slightly produced costa and the slightly differently shaped coxite lobes.

Totally black, at least in male, A.R. 1·1, wings with accessory posterior fork, Cu_1 bent, male coxite with three narrow inner lobes or appendages, styles rigid or probably so.

Male. Wing length 1·0 mm.

Head, mouthparts, antennae and plumes black, eyes bare, A.R. 1·1. *Thorax* totally black, slightly shining. *Legs* dark brown, L.R. 0·7, pulvilli absent. *Wings* clear, venation as in Text-fig. 13, *m*, accessory posterior fork present, Cu_1 bent,

costa slightly produced. Halteres black. *Abdomen* black; hypopygium (Text-fig. 14, *l*) without anal point, coxite with three inner appendages as shown, narrower at its extremity so that style is probably rigid; style tapered and with a few longer hairs along its length, single small apical spine present.

Female not known.

Holotype male, TRANSVAAL: Gladdespruit, nr. Badplaats, ix.1954 (*A. D. Harrison*) in British Museum.

Smittia hamata sp. n.

Quite similar to *subtrilobata* in appearance, but differs in shape of coxite lobes, also halteres white and apical antennal segment shorter, female with separate scutal stripes.

Male. Wing length 0·8 mm.

Head, mouthparts and antennae blackish, eyes bare, A.R. 0·8. Thorax quite black, slightly shining. *Legs* brown, L.R. 0·7, pulvilli absent. *Wings* clear, whitish by reflected light, anal lobe greatly reduced, venation as in Text-fig. 13, *n*, accessory posterior fork present, Cu_1 bent, costa more retracted than *subtrilobata*; halteres white or yellow. *Abdomen* black; hypopygium (Text-fig. 14, *m*) of same general structure as *subtrilobata*, but coxite lobes only two in number and not as elongate, apical one hooked; style very similar.

Female with separate scutal stripes, background yellow, very similar to female of *hirtella*, but distinguishable by the longer posterior fork.

Holotype male and paratypes 1 ♂, 5 ♀, TRANSVAAL: Kruger National Park, Skukuza, Sabie River, v.1955 (*A. D. Harrison*); 1 ♂, Mica-Gravellotte Road, v.1955 (*A. D. Harrison*); 1 ♂, Nelspruit, Crocodile River, ix.1954 (*A. D. Harrison*). Three paratypes placed in South African Museum, remainder of series in British Museum.

Smittia capicola Freeman

Pseudosmittia capicola Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 208.

A small black species belonging to Edwards' Group E, lacking accessory posterior fork, Cu_1 bent, costa retracted and produced; A.R. very short, only 0·2.

Male. Wing length 1·0 mm.

Head, mouthparts and antennae black, last flagellar segment short, hardly longer than preceding two together, A.R. 0·2, eyes bare. *Thorax* completely black and slightly shining. *Legs* dark brown, L.R. 0·6, pulvilli absent. *Wings* milky, venation (Text-fig. 13, *o*) with costa produced, but well retracted, Cu_1 bent, An not reaching fork, anal lobe reduced. Halteres black. *Abdomen* black; hypopygium (Text-fig. 14, *n*) with well developed bare anal point arising rather basally on the tergite; inner lobe of coxite large and of characteristic shape, style narrow and with large spine.

Female not known.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE: holotype and 3 ♂, x.1952, and 3 ♂, iv.1953, Berg River, French Hoek Forest Reserve (*K. M. F. Scott*).

? *Smittia capensis* Kieffer

Camptocladius capensis Kieffer, 1914, *Ann. S. Afr. Mus.* **10**, 261.

The type of this species is not to be found in the South African Museum with the others described in the same paper and must be presumed lost. From the description it may be a species of *Smittia*, but identification of the species is impossible. The following account is taken from the original description.

Male. Totally black ; A.R. 1·5 ; wing membrane without microtrichia, costa not produced, ending a little basal to level of apex of M_{3+4}, posterior fork well distal to r–m, Cu_1 bent in its distal half ; legs with long hairs, pulvilli absent. Length 2·2 mm.

Type locality, Cape Town.

? *Smittia kribiensis* Kieffer

Camptocladius kribiensis Kieffer, 1923, *Ann. Soc. ent. France* **92**, 186.

This species, described from a female in spirit is unrecognizable and is placed here in some doubt ; the type is almost certainly lost. The following is taken from the original description.

Female. Length 0·8 mm.

Colour yellowish white, mesonotal stripes, sternopleuron and postnotum brownish, halteres white. Eyes bare, antennae brownish, of six segments, 3–5 flask-shaped and with necks hardly longer than thick, segment 6 nearly twice as long as 5. Wings without distinguishable microtrichia, gradually narrowed towards the base ; R_{4+5} reaching costa more or less at level of apex of M_{3+4}, costa produced for a distance equal to twice length of cross-vein, posterior fork well distal to cross-vein, Cu_1 feebly bent in its distal half. Legs brownish, L.R. 0·5. Abdomen with brownish incisures, cerci white.

Type locality FRENCH CAMEROONS : Kribi.

Smittia sp. incert.

Among the material sent to me at various times from Cape Province, French Hoek Forest Reserve, by Dr. K. M. F. Scott, there are females of a species of *Smittia* in which in most specimens there are macrotrichia on the lower surface of vein M_{1+2}. The thorax is yellow with black stripes, Cu_1 is bent and the anal vein just passes the posterior fork. However, in some specimens which are in other respects identical, there are no traces of macrotrichia on this vein, whilst others may have as many as ten. I do not feel justified in describing this species from the female alone when this unusual character is subject to such wide variation.

Genus *KNEPPERIA* Kieffer

Knepperia Kieffer, 1908, *Denkschr. Med. Naturw. Ges. Jena* **13**, 155.

The following definition is taken from the original : eyes bare, not narrower above ; palpi long and four segmented ; antennae, head and thorax as in *Chironomus*. Wing membrane bare, with fine and close punctures ; R_{4+5} ending as far from the wing tip as Cu_1. No clear pulvilli or empodium. Hypopygium as in *Chironomus*

i.e. with lower pubescent and upper bare, inner appendages to the coxite, but instead of one there are two bare upper processes.

There was one included species, *K. gracilis* Kieffer. This has Orthocladiine spurs on the tibia and a peciular male hypopygium. I am reproducing Kieffer's figures (Text-fig. 15) of wing venation and hypopygium to aid identification. The type specimens are not in Zoologische Museum, Berlin, and must be presumed lost. Length 2·5 mm.

FIG. 15. *Knepperia gracilis* (after Kieffer, 1908). (*a*) wing ; (*b*) male hypopygium.

Knepperia is almost certainly an Orthocladiine genus, but it is difficult to say from Kieffer's description whether it is a peculiar genus or whether the description is simply a poor description of an already known genus. The hypopygium bears some resemblance to species of *Cardiocladius*, but the absence of anal lobe to the wing precludes that. There is also a resemblance to the species of *Smittia* near *S. subtrilobata* sp. n., but the size is too great for that. Exact identification will have to wait further collecting in the type locality.

Type locality, SOUTH WEST AFRICA : Rooibank, v.1905.

SUBFAMILY CORYNONEURINAE

Edwards (1929) treated all the species of this subfamily as species of one genus, *Corynoneura*, in the subfamily Orthocladiinae ; he recognized two subgenera. The venation is very distinctive and the group so readily recognized that I prefer to follow Goetghebuer (1932, *Faune de France* **23**, 131) and treat them as forming a separate subfamily which may be defined as follows.

R_1 and R_{4+5} entirely fused with one another and almost entirely fused with the thickened costa to form a " clavus ", which extends less than half the wing length in the male and not more than two-thirds of the wing length in the female ; a false vein runs from r–m below the clavus and then close to the wing margin almost as far as the wing tip ; wing membrane without macrotrichia or microtrichia, anal lobe of wing usually absent ; squama bare ; fourth tarsal segment shorter than the fifth and often more or less heart-shaped ; male antenna with 10–13 segments ; very small species, wing length less than 2 mm.

There is an interesting feature in the structure of the male hypopygium. The internal struts are larger than usual and exhibit specific differences throughout the subfamily ; their greatest development is in *Corynoneura*. Here the transverse

struts are lengthened (Text-fig. 16, *a*), articulate basally with the other pair, and form a pair of curved " parameres ". Edwards only found these structures in one of his groups, but in fact they are to be found in all species of the subfamily, although with greater or lesser development.

I am recognizing two genera in the subfamily and no subgenera, because I consider that the differences used by Edwards and Goetghebuer for defining their groups and subgenera are really only specific differences. I have seen material of seven species which can be placed in the same two genera as the Palaearctic species. Kieffer described a genus *Kribiocladius*, from a female stating that it belonged to " Groupe *Corynoneura* ", and I have with some doubt synonymized it with *Thienemanniella*. Tables I and II (p. 292) list the species previously described by Kieffer and Goetghebuer.

KEY TO AFRICAN GENERA OF CORYNONEURINAE

Eyes pubescent ; posterior tibiae not swollen and without apical projection ; costa longer (Text-figs. 17, *b*, *c*) . . . . . *Thienemanniella* Kieffer

Eyes bare ; posterior tibiae somewhat swollen at tip, obliquely truncate and with a conspicuous apical projection on inner side ; costa shorter (Text-figs. 16, *b*, *c*) *Corynoneura* Winnertz.

Genus ***CORYNONEURA*** Winnertz

Corynoneura Winnertz, 1846, *Stettin. Ent. Zeitg.* **7**, 12 ; Kieffer, 1911, *Trans. Linn. Soc. Lond.* (*Zool.*) **14**, 363 ; Goetghebuer, 1939, in Lindner, *Flieg. Pal. Reg.* **3** (13f), 4.
Corynoneura subg. *Corynoneura* Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 367.
Eucorynoneura Goetghebuer, 1939, *Ibid.* **3** (13f), 4.
Paracorynoneura Goetghebuer, 1939, *Ibid.* **3** (13f), 7.

Eyes bare ; hind tibiae somewhat swollen at tip, obliquely truncate and with a conspicuous apical projection on inner side ; costa extending not more than two-fifths of wing in male and ending far before posterior fork, in female to about middle of wing and not quite to fork.

As mentioned above, I am treating *Corynoneura* as a full genus. Edwards arranged the eight British species in three groups which Goetghebuer (1939) raised to subgeneric status. Although the groupings are useful, I do not think they warrant such a high status and I do not propose to employ Goetghebuer's names.

Kieffer and Goetghebuer have each described a single species of *Corynoneura* from Africa.

KEY TO AFRICAN SPECIES OF *Corynoneura*

1. Antenna with rosette of short hairs at apex 2
   Antenna without rosette at apex 3
2. Rosette hairs as long as terminal segment, no plume hairs on this segment in male *cristata* Freeman
   Rosette hairs less than half length of terminal segment, which carries plume hairs basally in the male . . . . . *dewulfi* Goetghebuer
3. Apical antennal segment of male approximately equal in length to two proceding together . . . . . *seychellensis* Kieffer
   Apical antennal segment of male longer than the preceding four together *elongata* Freeman

Corynoneura dewulfi Goetghebuer

Corynoneura dewulfi Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**. 364.
Corynoneura scotti Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 209 (SYN. NOV.).

Examination of Goetghebuer's type has shown that his figure of the male antenna is quite inaccurate : there is a rosette of hairs at the apex and plume hairs on the basal half of the last segment. *C. scotti* thus falls as a synonym. It is very similar to the Palaearctic species *C. celtica* Edwards, but the rosette hairs are longer and there are more plume hairs at the base of the last segment.

A minute dark insect, sometimes paler at the base of the abdomen in the male ; female browner and with separate scutal stripes ; last antennal segment with apical rosette hairs half length of segment ; coxite with inner lobe, " parameres " long.

Male. Wing length 0·6–1·0 mm.

Head, mouthparts and antennae black or very dark brown ; flagellum 10-segmented, last segment (Text-fig. 16, *d*) about as long as two preceding together, slightly clubbed, with some plume hairs basally and a rosette of hairs apically, rosette hairs not longer than half length of segment ; eyes bare. *Thorax* entirely matt black or pleura may be pale, dorso-central bristles whitish. *Legs* yellow or brown, knees often darkened, L.R. 0·6, posterior basitarsus twice as long as second segment. *Wing* shape and venation as in Text-fig. 16, *b* ; clavus very short, posterior fork also short. Halteres yellow or brown. *Abdomen* blackish, usually rather paler on four basal segments, occasionally whitish on these segments ; hypopygium (Text-fig. 16, *a*) with struts as shown ; " parameres " long and flattened at apex ; IXth tergite simple, lacking anal point but with a few hairs ; coxite with inner lobe near apex, styles simple.

Female. Head blackish, mouthparts yellow, antennae pale with last segment darker and bearing an apical rosette, all segments more or less equal. Thorax with yellowish background and three dark brown stripes, usually well separated, scutellum and postnotum blackish. Legs yellow, halteres yellow, wing venation as in Text-fig. 16, *c*. Abdomen may be yellowish basally, darker near apex, each segment translucent for apical quarter.

Holotype male of *dewulfi* in Musée Royal du Congo Belge ; of *scotti* in British Museum.

DISTRIBUTION. CAPE PROVINCE : holotype and some paratypes of *scotti*, Kirstenbosch, iv.1952 ; other paratypes Berg River, Wellington and French Hoek, v, vii, ix, x.1952 (all coll. *K. M. F. Scott*). NATAL : 1 ♂, 1 ♀, Giant's Castle Camp, Bushman's River, ix.1953 (*A. D. Harrison*). TRANSVAAL : 8 ♂, 1 ♀, Lydenburg Distr., Santa River and 5 ♂, nr. Johannesburg, iv.1955 (*A. D. Harrison*). TANGANYIKA : 12 ♂, Kilimanjaro, iii.1951 (*R. G. Tapley*). UGANDA : 1 ♂, 1 ♀, Ruwenzori Range, Kilembe, 4,500 ft., xii.1934 (*F. W. Edwards*). BELGIAN CONGO : holotype and paratypes 2 ♂, Escarpement Kabasha, Chambi x.1933 (*de Wulf*).

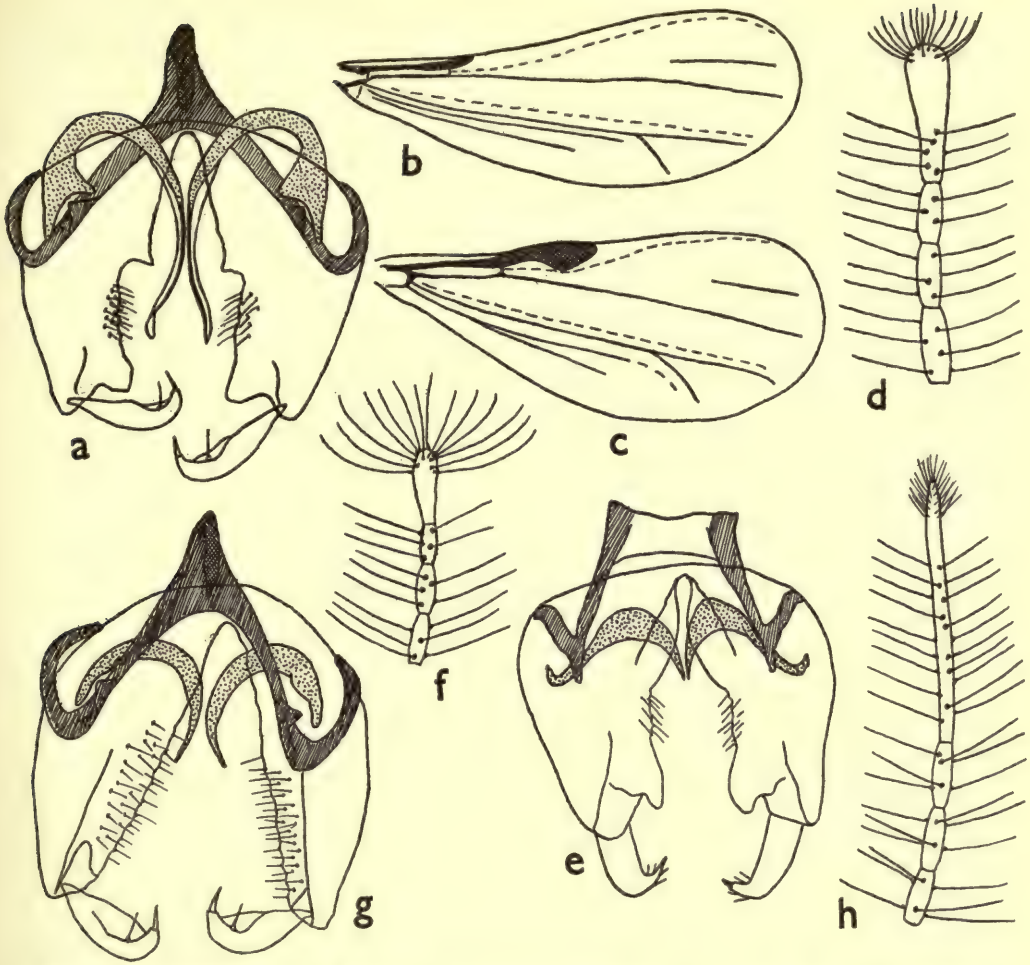

FIG. 16. *Corynoneura*. *C. dewulfi* : (*a*) male hypopygium ; (*b*) male wing ; (*c*) female wing ; (*d*) apex of male antenna. *C. cristata* : (*e*) male hypopygium ; (*f*) apex of male antenna. *C. elongata* : (*g*) male hypopygium ; (*h*) apex of male antenna. Only bases of antennal plume hairs shown.

Corynoneura cristata Freeman

Corynoneura cristata Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 209.

Similar to *dewulfi* in size, colour, wing venation and proportions of legs, differing in structure of apex of antenna and in hypopygium.

Male. Antenna with 10-segmented flagellum ; last segment slightly clubbed and about equal to preceding two together (Text-fig. 16, *f*), with no plume bristles but with an apical rosette of long hairs each being longer than the segment itself. Hypopygium (Text-fig. 16, *e*) differing from *dewulfi* in the structure of the struts, the median one being broader and the " parameres " short and flat ; apex of style sharply bent.

Female not known.

Holotype male and 2 ♂ paratypes CAPE PROVINCE, French Hoek Forest Reserve, x.1952 (*K. M. F. Scott*) in British Museum. There are no other records.

Corynoneura elongata Freeman

Corynoneura elongata Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 210.

Similar to *dewulfi* and *cristata*, but differing in antennal and hypopygial structure.

Male. Antenna (Text-fig. 16, *h*) with 10-segmented flagellum ; apical segment rather longer than the four preceding together, narrow and not clubbed, with plume hairs for nearly three-quarters of its length, apex with short hairs not arranged in a rosette. Hypopygium (Text-fig. 16, *g*) with internal struts very similar to *dewulfi*, but " parameres " shorter ; coxites with no inner lobes.

Female very similar to *dewulfi* but differs in the absence of apical antennal rosette, the hairs resembling those of male.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE : holotype and 1 ♂ paratype Berg River, French Hoek Forest Reserve, x.1952 (*K. M. F. Scott*). 4 male paratypes Zeekoe Vlei xi. 1952 (*K. M. F. Scott*). TRANSVAAL : 15 ♂, 8 ♀, Olifantsvlei, nr. Johannesburg, ii, iii, iv, vii, viii.1954 (*A. D. Harrison*).

Corynoneura seychellensis Kieffer

Corynoneura seychellensis Kieffer, 1911, *Trans. Linn. Soc. Lond.* (*Zool.*) **14**, 363.

There is a single male of the type series in the British Museum lacking the abdomen. In colour it differs from *dewulfi* by the dark brown instead of black thorax. In structure it resembles *dewulfi* except for the arrangment of the short hairs at the apex of the antenna, which do not form a rosette but which spread down the antenna for a distance equal to the width of the last segment. I have not been able to examine the hypopygium.

DISTRIBUTION. Known only from the type locality of SEYCHELLES : Mahé, Cascade Estate, 800–1,500 ft.

Genus *THIENEMANNIELLA* Kieffer

Thienemanniella Kieffer, 1911, *Bull. Socl ent. France*, 187 ; Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**, 365–6 (in part) ; Goetghebuer, 1939, in Lindner, *Flieg. Pal. Reg.* **3** (13f), 1.
? *Kribiocladius* Kieffer, 1923, *Ann. Soc. ent. France* **92**, 181.
Corynoneura subg. *Thienemanniella* Edwards, 1929, *Trans. ent. Soc. Lond.* **77**, 366.

Eyes pubescent ; posterior tibiae not swollen and without apical projection ; costa in male extending to two-fifths of wing length and nearly to posterior fork, in female to beyond middle of wing and posterior fork.

I am treating this group as a full genus and not as a subgenus of *Corynoneura*.

Kieffer described *Kribiocladius* from a single female with pubescent eyes from French Cameroons. He stated in the key to genera that it belonged to " Groupe *Corynoneura* " and although his description is difficult to follow, it seems likely that

he was dealing with a species of *Thienemanniella*. I am unable to include the species in the key.

Goetghebuer has described two species in this genus, the type series of which I have examined in Musée Royal du Congo Belge. The first, *T. chambiensis*, does not belong to this genus at all but is a species of *Stempellina* (subf. Chironominae) thus accounting for the peculiar venation and the presence of macrotrichia on the wing. The type series of other species, *T. trivittata*, is a mixed series and is dealt with below.

KEY TO AFRICAN SPECIES OF *Thienemanniella*

1. Anal lobe of wing present though not produced (Text-figs. 17, *b*, *c*), basal abdominal segment with group of 4–6 bristles each side, last segment of male antenna as long as preceding three together . . . . . *trivittata* Goetghebuer
   Anal lobe reduced (Text-fig. 17, *f*), only a single bristle each at base of abdomen . 2
2. Last segment of male antenna equal to preceding five together; thorax of male black . . . . . *antennata* Freeman
   Last segment of male antenna shorter than preceding two together; thorax of male with separate stripes . . . . . *lineola* Freeman

Thienemanniella trivittata Goetghebuer

Thienemanniella trivittata Goetghebuer, 1935, *Rev. Zool. Bot. Afr.* **27**, 53.
Thienemanniella analis Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 212 (SYN. NOV.).

The type series of *T. trivittata* consists of three specimens, one male and two females, all of different species. One of the females is *Corynoneura dewulfi* and may have been mixed by Goetghebuer when he wrote the labels, the other two can probably be considered as the true type series and both belong to species since described by me: the female to *T. analis* and the male probably to *T. lineola*. Although Goetghebuer did not categorically state the sex of the type in his description, it is clear that he intended it to be the female which I now fix as lectotype. This means that *T. analis* becomes a synonym. The shape of the anal area in Goetghebuer's figure of the wing is quite inaccurate.

Male blackish, female more yellow and ith separate stripes; last segment of male antenna as long as preceding three together; flagellum with 12 segments; wings with anal area well developed; first abdominal segment in both sexes with a group of 4–6 bristles each side.

Male. Wing length 1–1·2 mm.

Head, antennae and plumes blackish, mouthparts brown; flagellum with 12 segments, last segment (Text-fig. 17, *d*) slightly clubbed and as long as preceding three together, basal half of it with plume hairs, apex with short hairs; eyes with short pubescence. *Thorax* black, stripes fused. *Legs* brown, L.R. 0·75, fourth tarsal segment rather bilobed, last one flattened dorso-ventrally. *Wings* milky, venation (Text-fig. 17, *b*) with clavus not reaching level of posterior fork, anal area well developed but not produced squama bare. Halteres with whitish knobs. *Abdomen* black, browner ventrally, with bristly hairs across bases of all segments, segment 1 with a group of 4–6 each side only, segments 2–7 with 9–11 in a row across, segment 8 with 1–2 only. Hypopygium (Text-fig. 17, *a*) with struts smaller than in *Corynoneura*, " parameres " strongly curved and bent over at tips.

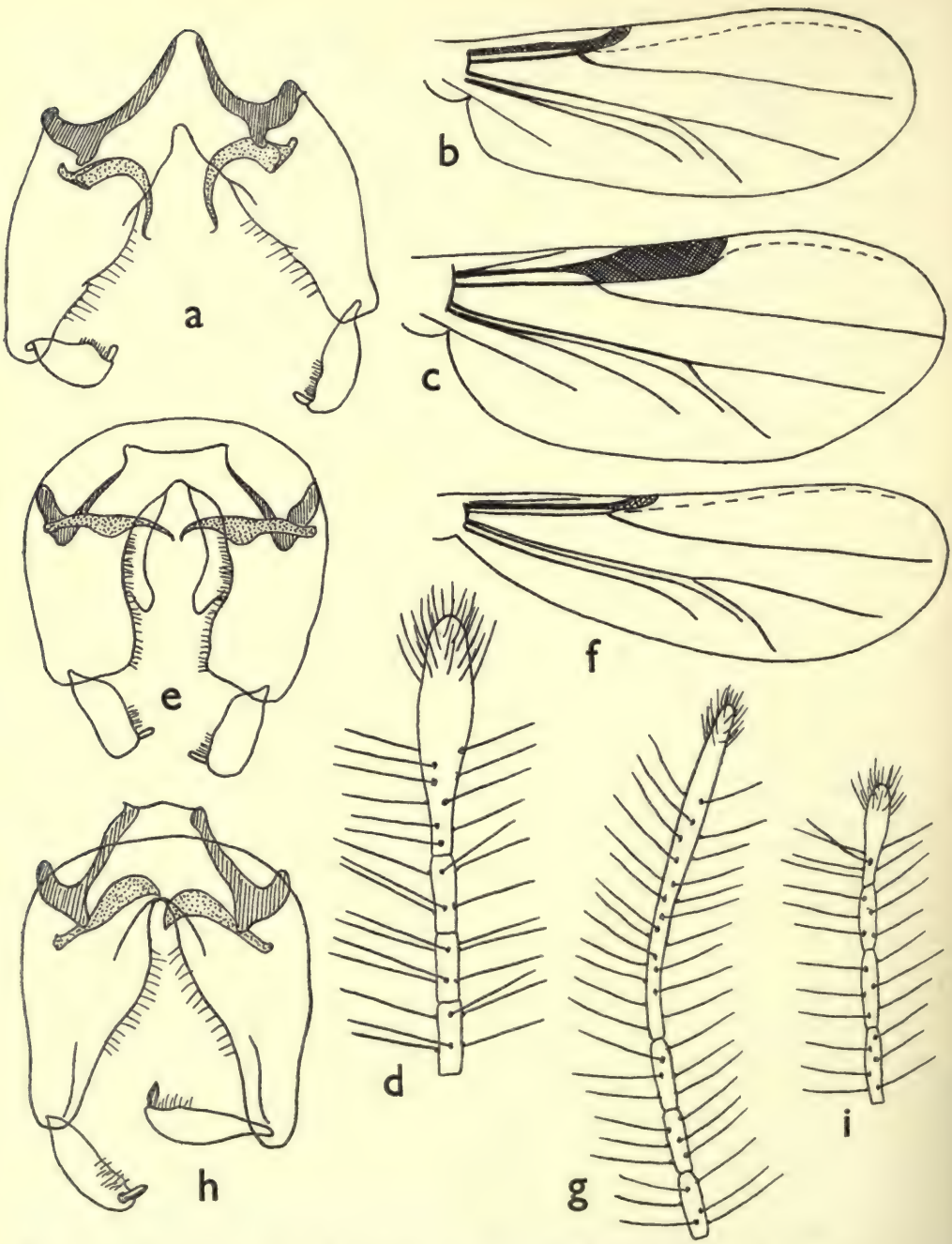

FIG. 17. *Thienemanniella*. *T. trivittata :* (*a*) male hypopygium ; (*b*) male wing ; (*c*) female wing ; (*d*) apex of male antenna. *T. antennata :* (*e*) male hypopygium ; (*f*) male wing ; (*g*) apex of male antenna. *T. lineola :* (*h*) male hypopygium ; (*i*) apex of male antenna. Only bases of antennal plume hairs shown.

Female. Head yellowish, antennae brown, segments 2–5 moniliform, 6 as long as 4–5 together and with short hairs at apex. Thorax yellowish with three separate brown stripes, scutellum and base of postnotum yellow, apex of postnotum and sternopleuron brown. Wings with clavus longer than in male (Text-fig. 17, *c*), anal area also large. Halteres whitish. Abdomen brown with bristles arranged as in male.

Lectotype female of *trivittata* in Musée Royal du Congo Belge ; holotype male of *analis* in British Museum.

DISTRIBUTION. CAPE PROVINCE : type series of *analis* from French Hoek Forest Reserve, Wemmer's Hoek and Wellington, v.1952 and ix–x.1952 (*K. M. F. Scott*). NATAL : 1 ♂, Bushman's River, Giant's Castle Camp, ix.1953 (*A. D. Harrison*). TRANSVAAL : 1 ♂, 1 ♀, Lydenburg Distr., Santa River, iv.1955 (*A. D. Harrison*). BELGIAN CONGO : type ♀ of *trivittata*, Escarpement Kabasha, Chambi.

Thienemanniella antennata Freeman

Thienemanniella antennata Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 212.

Very similar in general appearance to *trivittata*, but easily separated by reduction of anal area and fewer abdominal bristles ; separable from it and from *lineola* by the elongate apical antennal segment of male, flagellum 10-segmented.

Male. Wing length 1·0 mm.

Head and antennae black ; flagellum with 10 segments only, last segment (Text-fig. 17, *g*) elongate and about as long as preceding five together, with plume hairs for most of its length and short hairs at the tip ; eyes pubescent. *Thorax* black, stripes fused. *Legs* as in *trivittata*. *Wings* (Text-fig. 17, *f*) with reduced anal area, venation very similar to *trivittata*. Halteres yellow. *Abdomen* black and with fewer bristles than in *trivittata* ; segment 1 with only one each side, remainder with 3–5 in a basal row. Hypopygium (Text-fig. 17, *a*) with struts more reduced, parameres nearly straight, coxite with inner lobe.

Female. Two females taken at the same time as some of the males of the type series probably belong to this species ; they resemble the female of *trivittata* except that the anal area of the wing is reduced and the abdominal chaetotaxy resembles the male.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE : type series, Berg River, French Hoek (type locality) and Piquetberg, vii and ix–xi.1952 (*K. M. F. Scott*). NATAL : 5 ♂, Tugela River, Colenso, ix.1953 (*A. D. Harrison*) ; 1 ♂, Mooi River, Kamberg Game Reserve, ix.1953 (*A. D. Harrison*). TRANSVAAL : 2 ♂, Great Usutu River, Amsterdam, ix.1954 (*A. D. Harrison*) ; 1 ♂, Lydenburg, ix.1954 (*A. D. Harrison*).

Thienemanniella lineola Freeman

Thienemanniella lineola Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22**, 212.

Male readily distinguished from males of other species known to me by the separate stripes ; anal lobe of wing reduced, flagellum 10-segmented, last segment short ; female indistinguishable from female of *antennata*.

Male. Wing length 1·0 mm.

Head dark, face yellowish, antennae black, flagellum 10-segmented, last segment (Text-fig. 17, *i*) shorter than the preceding two together, with plume hairs basally and short hairs apically; mouthparts yellowish; eyes with short pubescence. *Thorax* yellow with separate blackish scutal stripes, central one may be prolonged by a brown area; scutellum brown with yellow apex, postnotum and sternopleuron black. *Legs* similar to *trivittata*. *Wings* similar to *antennata*, anal area reduced; halteres pale. *Abdomen* blackish, bristles as in *antennata* though segment 1 may have one or two each side. Hypopygium (Text-fig. 17, *h*) with struts shaped as shown, coxites and styles both simple.

Females cannot be separated from females of *antennata*.

Holotype male in British Museum.

DISTRIBUTION. CAPE PROVINCE: holotype and paratypes, Berg River, French Hoek Forest Reserve, x.1952, further specimens iv.1952 and v.1953; 1 ♂, Kirstenbosch, iv.1952 (*K. M. F. Scott*). NATAL: 1 ♂, Bushman's River, Giant's Castle Camp, ix.1953 (*A. D. Harrison*). TRANSVAAL: 6 ♂, 4 ♀, Lydenburg Distr., Santa River, v.1955 and 1 ♂, Nelspruit, ix.1954 (*A. D. Harrison*). In addition the male cotype of *T. trivittata* probably belongs here, BELGIAN CONGO: Escarpement Kabasha, Chambi.

? *Thienemanniella flava* Kieffer

Kribiocladius flava Kieffer, 1923, *Ann. Soc. ent. France* **92**, 181.

As explained above, this species which was described from the female alone, is placed here in some doubt. The following is a résumé of the more important parts of the original description. The type is lost.

Female. Length 0·8 mm.

Yellow; postnotum, mesonotal stripes and sternopleuron brown; abdomen with transverse brown bands; halteres white. eyes pubescent; antennae 7-segmented, last segment three and a half times as long as 6; segments 2–6 globular, second hardly longer than third. Wings hyaline, bare, without distinguishable microtrichia. Costa reaching extremity of R_{4+5}; R_{2+3}, R_{4+5} and M_{1+2} indicated by traces or false veins, R_{2+3} reaching to two-thirds of R_{4+5}, stopping before reaching wing margin; R_{4+5} approaching point of wing, M_{1+2} ending near tip of wing; r–m oblique and thick, posterior fork hardly distal to it, M_{3+4} as long as petiole of fork, Cu_1 very oblique; An a little bent distally, both it and Cu_1 are fine. L.R. 0·6, pulvilli absent, empodium very short, posterior tibiae not thickened, comb dense as in *Orthocladius*, large spur as long as thickness of tibia.

Type locality FRENCH CAMEROONS: Kribi.

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ENTOMOLOGY Vol. 4 No. 8
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Pp. 369–406 ; 100 *Text-figures*

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A REVISION OF THE *BRÜELIA* (MALLOPHAGA) SPECIES INFESTING THE CORVIDAE

PART I

By M. ATIQUR RAHMAN ANSARI, M.Sc., Ph.D., D.Sc.

Institute of Hygiene and Preventive Medicine, Lahore.

INTRODUCTION

Two distinct types of *Brüelia* are found on the Corvidae. The first has the body feebly sclerotized and the abdominal chaetotaxy scarce ; these are similar to those species of *Brüelia* which commonly infest other passerines, for example, Fringillidae, Laniidae, Timaliidae and Sturnidae. In this group are *Brüelia deficiens* (Piaget), *B. zohrae* and *B. zavattariornis*. The second type has the body more heavily sclerotized and robust in form; this group can be further subdivided into forms with broad and narrow heads respectively.

The identification of the different members of the genus *Brüelia*, especially of females, is sometimes very difficult. The distinguishing features utilized here have been mainly the shape of the head, the length of the preantennal region and its width, as well as the index of the total head length to the width. An examination of the male genitalia shows that there are a number of distinct and easily recognizable species. The abdominal chaetotaxy and shape of the tergal plates and the shape of the female genital plate are also helpful in separating the species. With respect to the genital plate, it is not only the pattern of coloration but also the number of marginal hairs which are of use. During these studies we have observed that allied forms are commonly indistinguishable from each other in the female sex, though easily separated in the male. In the present communication the taxonomy is, therefore, mainly based on the male sex.

The linear measurements were taken along the midline ; the length of the pre-antennal region is from the anterior margin to an imaginary line drawn between a point immediately behind each conus ; the region behind this line is considered as the hind-head. Breadths represent the maximum transverse measurement of the part. The cephalic index is the ratio of length to breadth of the head (Waterston, 1928). As the length and breadth of the head remain fairly constant for a species they can be used as reliable criteria of specific difference.

Most of the specimens including holotypes and allotypes are in the collections of

the British Museum (Natural History) ; exceptions are indicated in the text. Text-figures were drawn from the type material with an Abbé camera lucida.

ACKNOWLEDGMENTS

The author considers it his privilege to express his deepest gratitude to Miss Theresa Clay for her advice and suggestions at every stage of this work. He also wishes to thank Mr. N. D. Riley for so very kindly giving him facilities to work in his department. Grateful thanks are also due to Mr. G. H. E. Hopkins for the loan of some notes on the nomenclature of described species. To his former Professor, Mr. M. Afzal Husain, the author is much indebted for inspiration and encouragement throughout these studies. He would also like to put on record the help and cooperation he has received from his wife, Zohra Rahman during his stay in England.

Brüelia glandarii (Denny), 1842

(Text-figs. 1—6)

Nirmus glandarii Denny, 1842, *Mon. Anopl. Brit.* : **51**, 129, pl. 8, fig. 3.

Type host : *Garrulus glandarius rufitergum* Hartert.

MALE. Head triangular with broadly concave apex. Pre-antennal area with marginal carina interrupted medianly and laterally. Anterior margin hyaline. Dorsal suture well marked. Anterior plate squarish with conspicuous ventral component. Ventral carina interrupted medianly and continuous with the premarginal carina. Postantennal region with narrow marginal carina, with enlarged postocular nodus and occipital nodus. The number and arrangement of the setae of head as described by Clay (1951). Antenna exhibits sexual dimorphism. Basal segment is about 1·5 times as long as the conus. (In the female this segment is almost as long as the conus.)

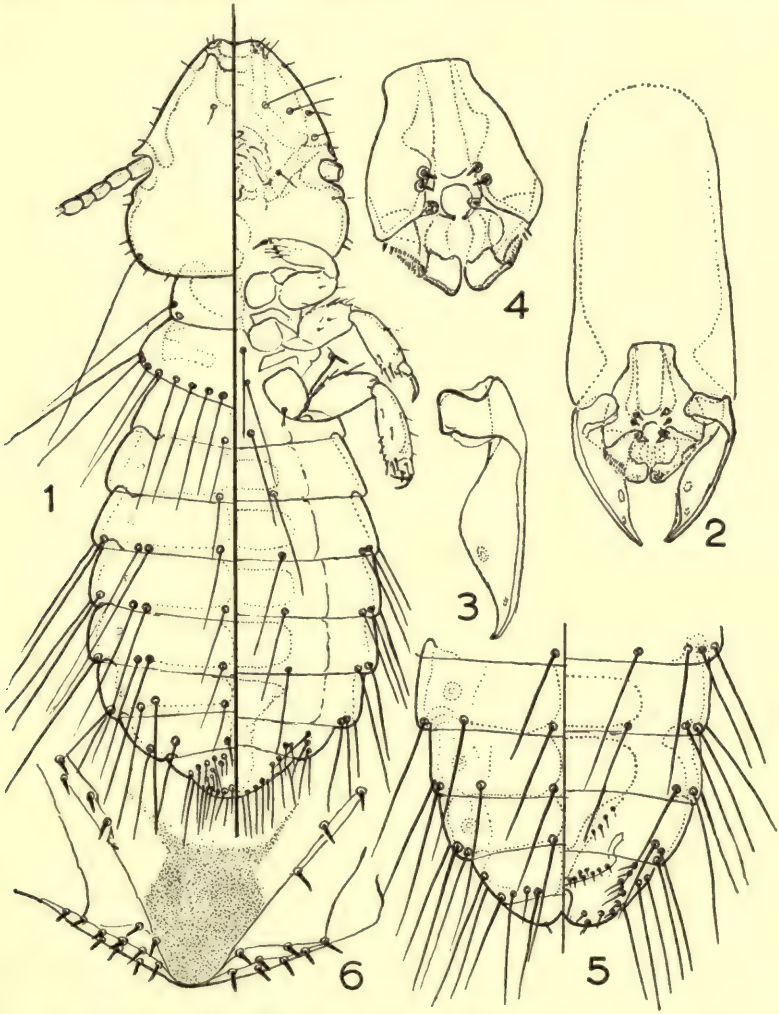
Prothorax transverse, with one long dorsal hair in the posterior angle. Pterothorax trapezoidal, broadly angled over abdomen, laterally divergent with 6–8 elongate setae on the dorsal posterior margin on each side.

Abdomen elliptical, with broadly rounded terminal segment. Segments II–VIII with approximate tergal plates, varying considerably in area and pigmentation in various specimens, usually feebly sclerotized. Sternal plates II–V fairly distinct, confined to the middle. Genital plate irregular. Chaetotaxy as shown in the figure and table below, the setae are definite in number and position except for some minute terminal hairs, which may vary slightly from specimen to specimen. Genitalia with basal plate twice as long as the parameres or its own distal width. Parameres simple, very broad in the middle and pointed apically, fitting closely to the sides of the mesosome when at rest. Mesosome much flattened, as shown in Text-fig. 4.

FEMALE. Similar to the male but the body is longer, with considerable differences in the abdominal chaetotaxy. Genital plate conical with 3–4 minute lateral spines

on segment VIII, vulva with 6–11 to 8–11 short and stout marginal spines arranged in 2–3 rows.

MATERIAL EXAMINED. 2 females (syntypes in Denny collection) from *Garrulus g. rufitergum*; 28 males and 59 females from *Garrulus g. rufitergum* from England;



FIGS. 1–6.—*Brüelia glandarii*. (1) Male; (2) male genitalia; (3) Paramere: (4) mesosomal plates; (5) terminal segments of female; (6) vulvar chaetotaxy.

14 males and 30 females from *Garrulus g. glandarius* from Hampshire, Estonia and N.E. Poland; 7 males 10 females from *Garrulus g. theresae* from Morocco; 2 females from *Garrulus g. krynicki* from Asia Minor.

LECTOTYPE. Female (Denny Collection, slide no. 256) from *Garrulus g. rufitergum*; paratype one female.

Abdominal Chaetotaxy

		Male.			Female (lectotype).		
		Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	.	6–8+6–8	1+1	—	7–8+7–8	1+1	—
Abdomen II	.	1+1	1+1	0+0	1+1	0+0	0+0
III	.	1+1	1+1	0+0	1+1	0+0	0+0
IV	.	1–2+1+1+2	1+1	2+2	1+1+1+1	1+1	2+2
V	.	2+1+1+2	1+1	3+3	1+1+1+1	1+1	3+3
VI	.	2–3+1+1+2	1+1	4+4	1+1+1+1	1+1	3+3
VII	.	1–2+1+1+2	—	4+4	1+1+1+1	—	3+3
VIII	.	2+1+1+2	—	4+4	0+1+1+0	—	4+4
IX–X	.	1+5+5+1	—	2+2	—	—	—
				6+13	Vulva 6–11+8–11		
					See Text-fig. 5.		

Measurements (mm.) : Length × Breadth

	Male.	Female (lectotype).
Head : pre-antennal .	0·198×0·321	0·226×0·369
hind head . .	0·239×0·290	0·239×0·452
Prothorax . . .	0·103×0·233	0·103×0·274
Pterothorax . . .	0·171×0·383	0·191×0·390
Abdomen . . .	0·904×0·473	0·021×0·561
L : B of pre-antennal .	1 : 1·62	1 : 1·64
L : B of hind head .	1 : 1·63	1 : 1·89
Cephalic index . .	1 : 0·89	1 : 0·97

Brüelia glandarii perisoreus subsp. nov.

(Text-figs. 1*a*, 3*a*)

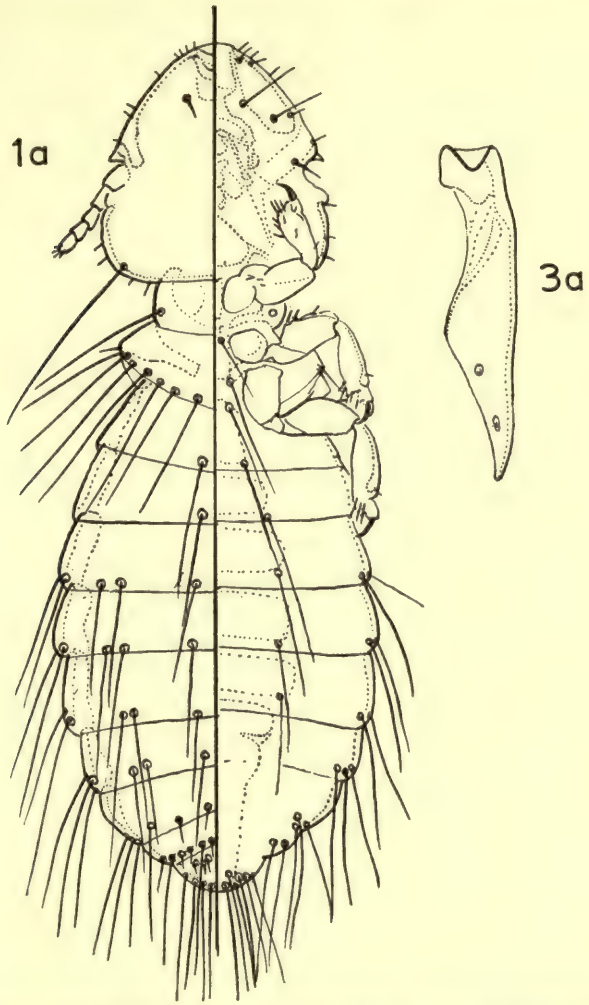
This species is allied to *Brüelia glandarii* (Denny) from which it can be separated by the shape of the pre-antennal region.

MALE. Antenna sexually dimorphic, but the difference is very slight. Tergal plates entire, feebly sclerotized. Sternal plates and genital plate well sclerotized. Details of head of parameres, shape of endomeres and of mesosome as in *Brüelia glandarii* except the parameres are not as broad and the total length is relatively longer.

FEMALE. As in *glandarii* except for shape of head.

Measurements (mm.).

	male (holotype).	Female (allotype).
Head : pre-antennal .	0·212×0·356	0·219×0·377
hind head . .	0·205×0·404	0·226×0·417
Prothorax . . .	0·089×0·226	0·103×0·261
Pterothorax . . .	0·157×0·356	0·157×0·404
Abdomen . . .	0·904×0·561	1·321×0·671
L : B pre-antennal .	1 : 1·68	1 : 1·72
L : B hind head . .	1 : 1·97	1 : 1·84
Cephalic index .	1 · 0·96	1 : 0·94



FIGS. 1*a* and 3*a*.—*Brüelia glandarii perisoreus* subsp. n. (1*a*) Male (dorsal and ventral); (3*a*) Paramere.

MATERIAL EXAMINED. 22 males and 47 females from *Perisoreus i. infaustus* (Linn.) from Lapland. *Holotype* (male) *allotype* (female) on slide no. 11103 in Meinertzhagen collection (British Museum (Nat. Hist.)), from *Perisoreus i. infaustus* from Lapland. *Paratypes*: 21 males and 46 females from the same host form (data above).

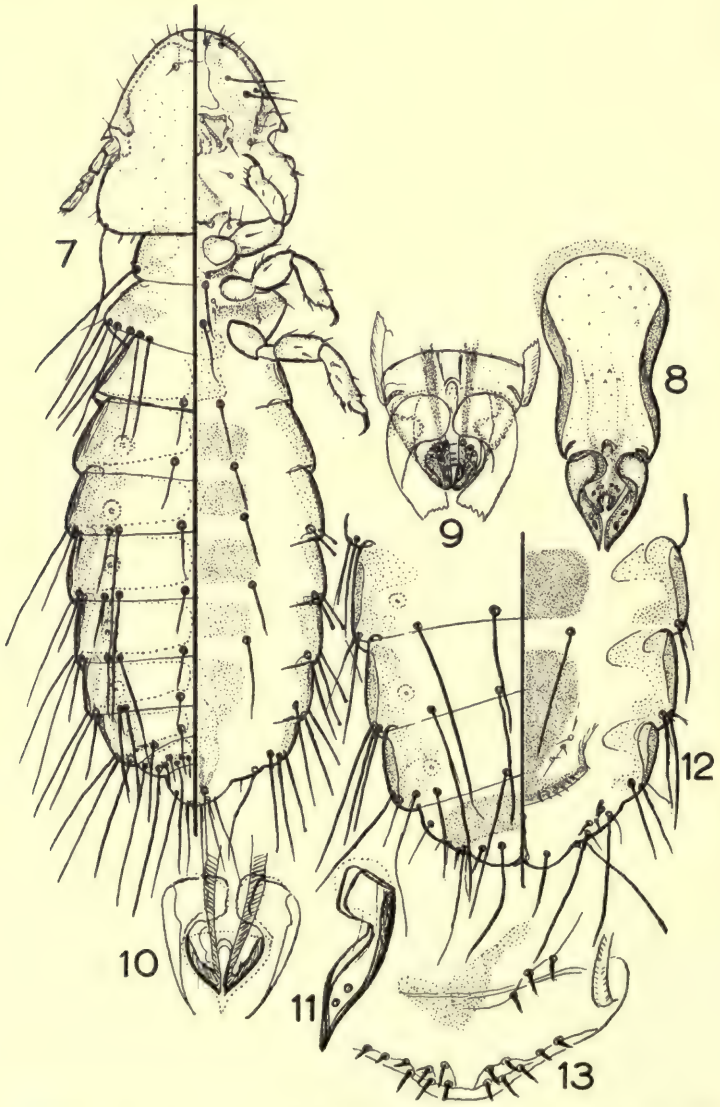
Brüelia clayae sp. n.

(Text-figs. 7–13)

This species is similar to *Brüelia glandarii* (Denny) from which it can be distinguished by the male genitalia.

MALE. As shown in Text-figs. 7–11. The body plates are strongly sclerotized. Chaetotaxy as in *Brüelia glandarii*. The genitalia are well developed. The shape and details of the head of parameres, shape of endomeres and telomeres and details of mesosome are characters which distinguish if from related species.

FEMALE. No reliable character can be found on which to separate the species from the females of *Brüelia glandarii*.



FIGS. 7–13.—*Brüelia clayae* sp. nov. (7) Male; (8) Male genitalia; (9–10) two different views of mesosomal plate; (11) paramere; (12) terminal segments of female; (13) vulvar chaetotaxy.

Measurements (mm.)

	Male (holotype).	Female (allotype).
Head : pre-antennal	0·177×0·308	0·198×0·342
hind head	0·205×0·377	0·219×0·411
Prothorax	0·082×0·205	0·082×0·226
Pterothorax	0·157×0·328	0·157×0·349
Abdomen	0·828×0·479	1·109×0·561
L : B pre-antennal	1 : 1·74	1 : 1·72
L : B hind head	1 : 1·84	1 : 1·87
Cephalic index	1 : 0·98	1 : 0·98

MATERIAL EXAMINED. 15 males, 20 females from *Cyanocitta cristata* (Linn.) from Virginia. *Holotype* (male) and *allotype* (female) on slide no. 12657–58 in Meinertzhagen collection (British Museum (Nat. Hist.)) from *Cyanocitta cristata cristata* from Virginia. *Paratypes* 14 males and 19 females from the type-host (data above).

This species is named in honour of Miss Theresa Clay, who has done much work to increase our knowledge of Mallophaga and removed so many ambiguities from the taxonomy of this group ; and also given much valuable help and advice to the author during this work.

Brüelia nitzschi Kéler, 1938

(Text-figs. 14–20)

Brüelia nitzschi, Kéler, 1938, *Arb. morph. tax. Ent. Berlin-Dahlem*, **5** : 232, fig. 2.

Type host : *Cyanocorax cyanomelas* (Vieillot).

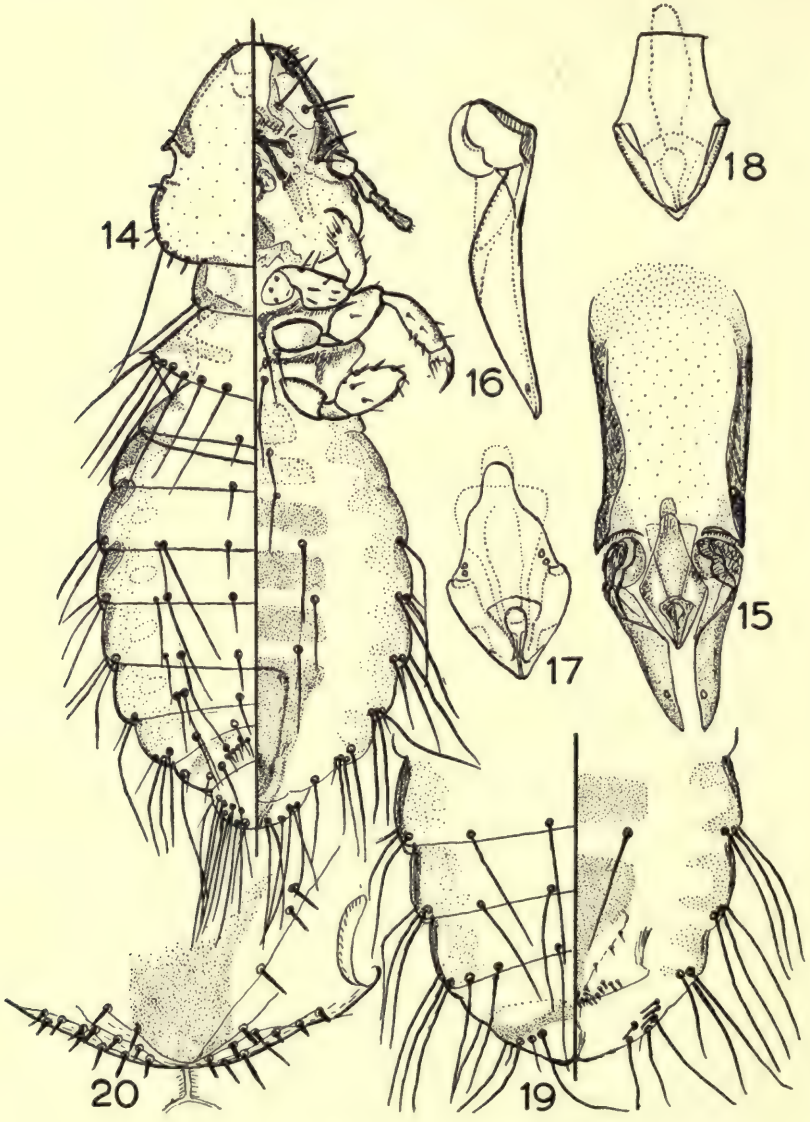
This species is similar to *Brüelia glandarii* (Denny) from which it can be distinguished by the male genitalia.

MALE. Marginal carina interrupted medianly, anterior plate well developed. Pleural plates well sclerotized, tergal plates indistinct, sternal and genital plate well developed. The characters of the head of the paramere, shape of the endomeres and telomeres and details of mesosome are typical and distinguish this species from allied forms.

FEMALE. Similar to the male, with differences in the abdominal chaetotaxy.

Abdominal Chaetotaxy

	Male.			Female.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	6+6	1+1	—	6+6	1+1	—
Abdomen II	1+1	1+1	0+0	1+1	1+1	0+0
III	1+1	1+1	0+0	1+1	1+1	0+0
IV	2+1+1+2	1+1	2+2	1+1+1+1	1+1	2+2
V	2+1+1+2	1+1	3+3	1+1+1+1	1+1	2+2
VI	2+1+1+2	1+1	3+3	1+1+1+1	1+1	3+3
VII	2+1+1+2	0+0	3+3	1+1+1+1	0+0	4+4
VIII	2+1+1+2	0+0	4+4	1+1+1+1	0+0	4+4
IX	8+8	0+0	1+1	3+3	0+0	2+2
	See Text-fig.			See Text-fig.		
				Vulva : 10+13		



FIGS. 14–20.—*Brüelia nitzschi*. (14) Male ; (15) male genitalia ; (16) paramere ; (17–18) two different views of mesosomal plate ; (19) terminal segments of female ; (20) vulvar chaetotaxy

Measurements (mm.)

	Male.	Female.
Head : pre-antennal	0·177×0·321	0·191×0·369
hind head	0·233×0·383	0·239×0·438
Prothorax	0·082×0·239	0·103×0·281
Pterothorax	0·171×0·417	0·219×0·431
Abdomen	0·821×0·582	1·233×0·698
L : B pre-antennal	1 : 1·81	1 : 1·93
L : B hind head	1 : 1·64	1 : 1·83
Cephalic index	1 : 0·93	1 : 1·02

MATERIAL EXAMINED.—5 males and 5 females from the type host *Cyanocorax cyanomelas* (Vieillot) from Brazil in British Museum (Nat. Hist.) collection.

Brüelia hopkinsi sp. nov.

(Text-figs. 21–27)

This species is close to *Brüelia glandarii* (Denny) from which it can be distinguished by the chaetotaxy which tends to be more sparse in this species, by the male genitalia and female genital plate.

MALE. Marginal carina entire, medianly less heavily sclerotized and indented, anterior margin hyaline. Ventral carina feeble. Pleural plates well developed, tergal plates and sternal plates well marked. Genitalia as shown in Text-figs. 22–25.

FEMALE. Similar to the male but varies in size and abdominal cheatotaxy.

Abdominal Chaetotaxy

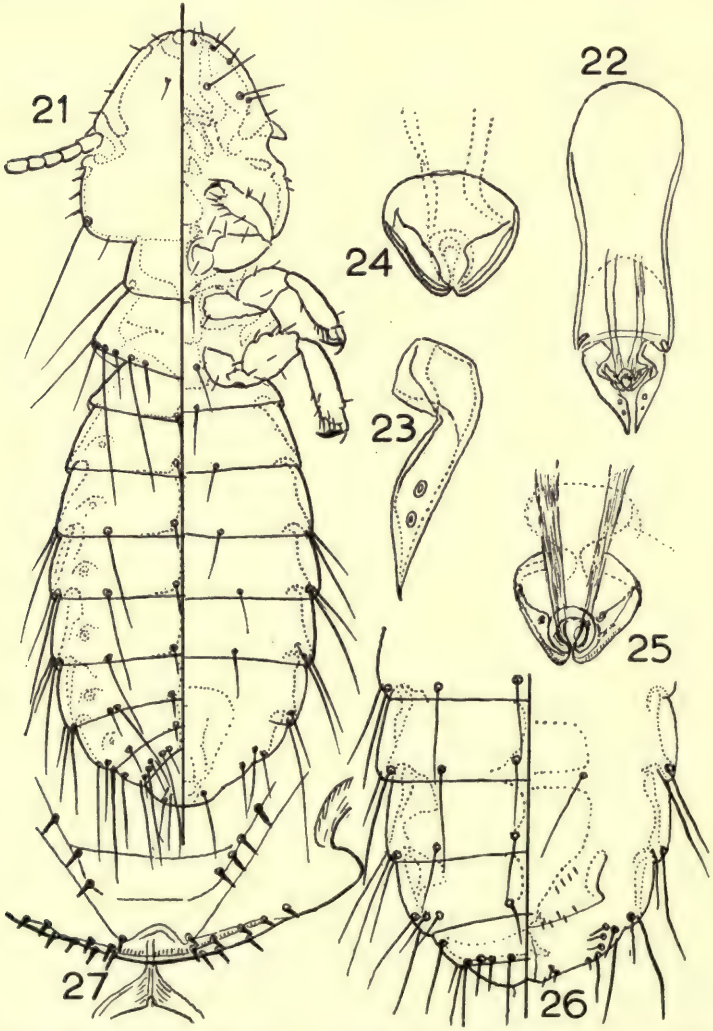
	Male.			Female.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	5–5+5–6	1+1	—	5–6+5–6	1+1	—
Abdomen II	1+1	1+1	0+0	1+1	1+1	0+0
III	1+1	1+1	0+0	1+1	1+1	0+0
IV	1+1+1+1	1+1	2+2	1+1+1+1	1+1	3+3
V	1+1+1+1	1+1	2+2	1+1+1+1	1+1	3+3
VI	1+1+1+1	1+1	3+3	1+1+1+1	1+1	3+3
VII	2+1+1+2	0+0	3+3	1+1+1+1	0+0	2+3
VIII	1+1+1+1	0+0	3+3	1+1+1+1	0+0	3+3
IX	7+7	0+0	1+1	4+4	0+0	3+3
X–XI	3+3	—	6+7	—	—	—

See Text-fig.

Vulva : 9+10 setae.

Measurements (mm.)

	Male (holotype).	Female (allotype).
Head : pre-antennal	0·191×0·315	0·198×0·335
hind head	0·191×0·363	0·212×0·417
Prothorax	0·089×0·212	0·123×0·253
Pterothorax	0·151×0·321	0·157×0·377
Abdomen	0·842×0·473	0·123×0·534
L : B pre-antennal	1 : 1·64	1 : 1·69
L : B hind head	1 : 1·90	1 : 1·96
Cephalic index	1 : 0·95	1 : 1·02



FIGS. 21–27.—*Brüelia hopkinsi* sp. nov. (21) Male ; (22) male genitalia ; (23–25) two different views of mesosomal plate ; (26) terminal segments of female ; (27) vulvar chaetotaxy.

MATERIAL EXAMINED. 3 males and 4 females from *Xanthoura yncas galeata* Ridgway from Colombia. *Holotype* (male), *allotype* (female) slide no. 4077 in Meinertzhagen collection (British Museum (Nat. Hist.)) from *Xanthoura yncas galeata* from Colombia. *Paratypes* 2 males and 3 females from type host (data above).

This species is named in honour of G. H. E. Hopkins as a modest recognition of his outstanding work on Phthiraptera and also to acknowledge my gratitude for the constant help I have received from him since I started work on Mallophaga.

Brüelia meinertzhageni sp. nov.

(Text-figs. 28–34)

This species is also very similar to *Brüelia glandarii* (Denny) from which it can be distinguished by the larger size, male chaetotaxy and genitalia.

MALE. Marginal carina interrupted medially and laterally. Anterior plate well marked. Dorsal suture distinct. Ventral carina feebly sclerotized. Tergal plates interrupted in the middle. Male genitalia as shown in Text-figs. 29–32. Details of the head of the parameres and of the mesosome distinguish it from allied forms. The dorsal setae in this species tend to be more numerous than in *Brüelia glandarii*.

FEMALE. Similar to male but with scarce dorsal abdominal chaetotaxy.

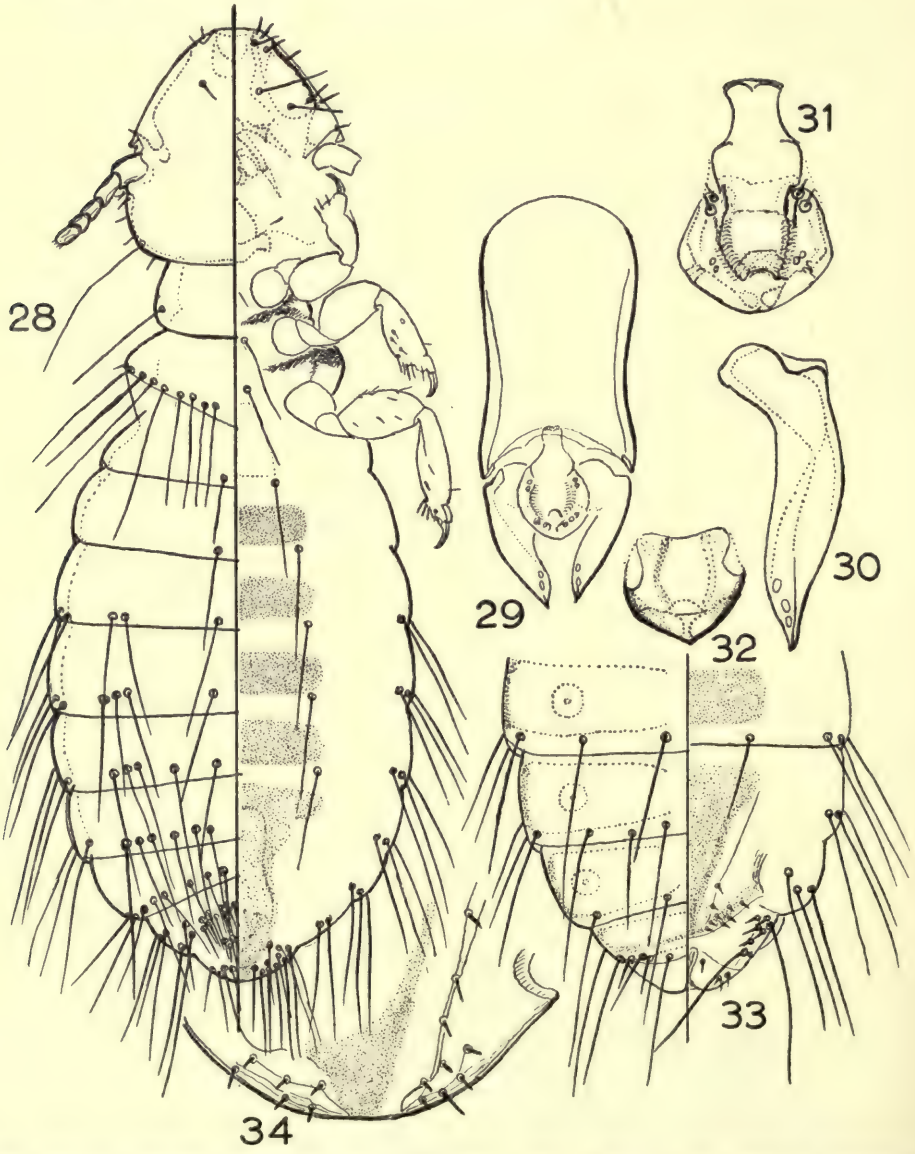
Abdominal Chaetotaxy

	Male.			Female.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	7–8+7–8	1+1	—	7+8	1+1	—
Abdomen II	1+1	1+1	0+0	1+1	1+1	0+0
III	1+1	1+1	0+0	1+1	1+1	1+1
IV	2–3+1+1+2–3	1+1	2+2	1+1+1+1	1+1	2+2
V	2–3+1+1+2–3	1+1	3+3	1+1+1+1	1+1	2+2
VI	3+1–2+1–2+2–3	1+1	3+3	1+1+1+1	1+1	3+3
VII	3+2+2+3	0+0	3+3	1+1+1+1	0+0	3+3
VIII	3+2–3+2–3+3	0+0	3+3	1+1+1+1	0+0	3+3
IX	/3+11–12	3+0	4+4	1+2+2+1	0+0	3+3
X–XI	See Text-fig.			See Text-fig. Vulva 6–8 setae.		

Measurements (mm.)

	Male (holotype).	Female (allotype).
Head: pre-antennal	0·205×0·363	0·205×0·383
hind head	0·219×0·417	0·239×0·404
Prothorax	0·103×0·261	0·103×0·246
Pterothorax	0·191×0·411	0·171×0·383
Abdomen	1·062×0·616	1·308×0·631
L : B pre-antennal	1 : 1·77	1 : 1·87
L : B hind head	1 : 1·90	1 : 1·67
Cephalic index	1 : 0·98	1 : 0·91

MATERIAL EXAMINED. 17 males and 37 females from *Dendrocitta rufa vagabonda* (Latham) from Nepal, Burma and Decan. *Holotype* (male), *allotype* (female) on slide no. 4061 from *Dendrocitta rufa vagabonda* from Burma in the Meinertzhagen collection (British Museum (Nat. Hist.)). *Paratypes* 16 males and 36 females from the type host (data above).



FIGS. 28–34.—*Brüelia meinertzhageni* sp. nov. (28) Male; (29) male genitalia; (3) paramere; (31–32) two different aspects of mesosomal plate; (33) terminal segments of female; (34) vulvar chaetotaxy.

This species is named in honour of Col. R. Meinertzhagen, who built up a Mallophagan collection, now at the British Museum, which is second to none.

Brüelia husaini sp. nov.

(Text-figs. 35–43)

This species is close to *Brüelia glandarii* (Denny) from which it can be distinguished by the shape of the head and chaetotaxy of segment IX.

MALE. Head, thorax and abdomen as in *Brüelia glandarii*. Tergal plates entire, feebly sclerotized. Sternal plates IV–VI distinct, confined to the middle. Abdominal chaetotaxy as given in table below. Genitalia as shown in the Text-figs. 38–41. Mesosome more or less polygonal in outline ; head of paramere well developed.

FEMALE. Similar to the male but differs in dorsal chaetotaxy and in being larger.

Abdominal Chaetotaxy

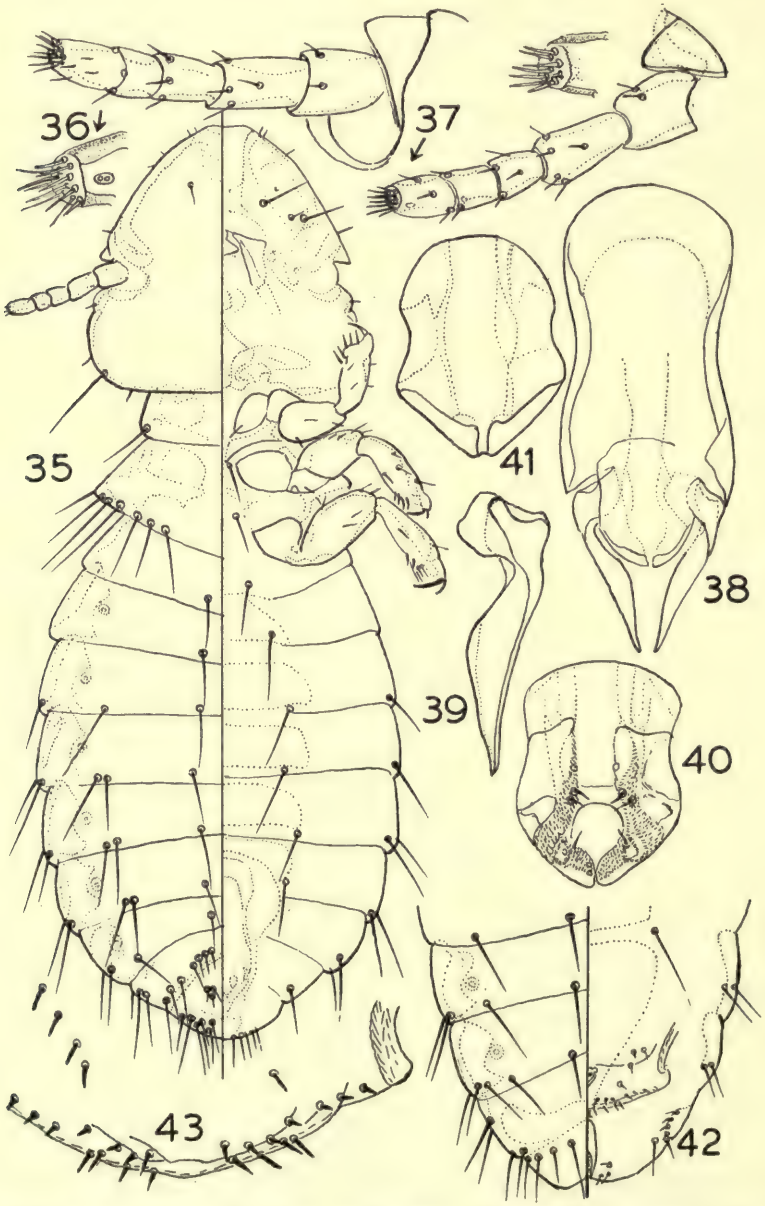
		Male.			Female.		
		Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax		6–8+6–8	1+1	—	7–8+7–8	1+1	—
Abdomen	II	1+1	1+1	0+0	1+1	1+1	0+0
	III	1+1	1+1	0+0	1+1	1+1	0+0
	IV	1+1+1+0	1+1	1+1	1+1+1+1	1+1	1+1
	V	2+1+1+2	1+1	1+1	1+1+1+1	1+1	2+2
	VI	2+1+1+2	1+1	1+2	1+1+1+1	1+1	3+2
	VII	2+1+1+2	0+0	1+2	1+1+1+1	0+0	3+3
	VIII	1+1+1+1	0+0	2+2	1+1+1+1	0+0	3+4
	IX	1–2+3–5+3–5+1–2	0+0	1+1	3+3	0+0	2+2
	X–XI	3+3	0+0	6–9	—	—	—
					Vulva : 10–18+10–13		

Measurements (mm.)

	Male (holotype).	Female (allotype).
Head : pre-antennal	0·246×0·411	0·253×0·452
hind head	0·239×0·479	0·253×0·521
Prothorax	0·109×0·287	0·096×0·301
Pterothorax	0·212×0·452	0·191×0·466
Abdomen	0·965×0·651	1·116×0·686
L : B pre-antennal	1 : 1·69	1 : 1·78
L : B hind head	1 : 1·97	1 : 2·06
Cephalic index	1 : 0·97	1 : ·103

MATERIAL EXAMINED. 6 males, 17 females from *Urocissa flavirostris cucullata* from Kashmir in Meinertzhagen collection (British Museum (Nat. Hist.)), Kulu in Ansari Collection. 5 males and 5 females from *Urocissa melanocephala occipitalis* from Nepal in Meinertzhagen collection and Kulu in Ansari Collection.

Holotype (male) and *allotype* (female) on slide no. 944 in Meinertzhagen collection from *Urocissa flavirostris cucullata* Gould, from Kashmir. *Paratypes* 5 males and 16 females from same host (data above).



FIGS. 35–43.—*Brüelia husaini* sp. nov. (35) Male; (36) male antenna; (37) female antenna; (38) male genitalia; (39) parameres; (40–41) two different aspects of mesosomal plate; (42) terminal segments of female; (43) vulvar chaetotaxy.

This species is named in honour of my former Professor M. Afzal Husain who always took a keen interest in my work and gave me instructions, help and encouragement from the day I started under him as his pupil.

Brüelia deficiens (Piaget), 1885

(Text-figs. 51–56*)

Nirmus deficiens Piaget, 1885, *Pédiculines Supplement* : **23**, pl. 3, fig. 3.

Type host : *Cyanopica cyanus cooki* Bonaparte

Unlike the previous species of *Brüelia* described from Corvidae, this species is delicate and feebly sclerotized and resembles those forms which infest passerines belonging to the families Fringillidae, Laniidae, Timaliidae and Sturnidae.

MALE. Marginal carina indented medially and the anterior margin of the head at this point hyaline. Abdominal chaetotaxy sparse, delicate and often seen with difficulty. Tergal plates feebly sclerotized. Sternal plates IV–VI distinct, sclerotized as two transverse components, giving an impression of two sternal plates to each segment. Genitalia delicate and typical for the species.

FEMALE. Similar to the male but the measurements are greater. Genital plate is polygonal, shield-shaped with acutely angulate posterior angle.

Abdominal Chaetotaxy

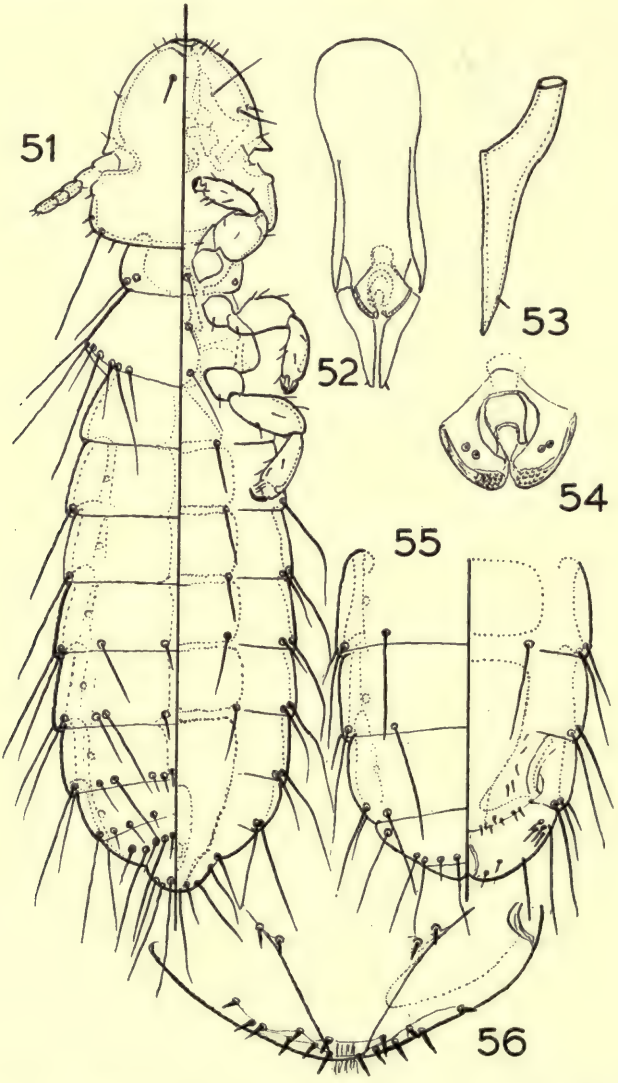
	Male.			Female.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	5–6+5–6	1+1	—	5–6+5–6	1+1	—
Abdomen II	0+0	1+1	0+0	0+0	1+1	0+0
III	0+0	1+1	1–0+1–0	0+0	1+1	1+1
IV	0+0	1+1	2+2	0+0	1+1	2+2
V	1+1+1+1	1+1	2+2	0+0	1+1	2+2
VI	2+1+1+2	1+1	2+2	1+1	1+1	2+2
VII	2+3+2+2	0+0	2+2	1+1	0+0	2+2
VIII	2+2+2+2	0+0	2+2	1+1	0+0	3+3
IX	4–5+4–5	0+0	2+2	1+3+3+1	0+0	2+2
X–XI	See Text-fig.			Vulva : 7+8 marginal hairs.		

Measurements (mm.)

	Male (type).	Female.
Head : pre-antennal	0·184×0·281	0·226×0·308
hind head	0·191×0·328	0·198×0·356
Prothorax	0·089×0·212	0·103×0·233
Pterothorax	0·171×0·321	0·191×0·356
Abdomen	0·952×0·404	1·301×0·445
L : B pre-antennal	1 : 1·52	1 : 1·37
L : B hind head	1 : 1·71	1 : 1·79
Cephalic index	1 : 0·87	1 : 0·84

* Owing to the rearrangement of Text-figures there are none under the numbers 44–50.

MATERIAL EXAMINED. Piaget's collection: one male (type) from *Cyanopica cyanus cooki* Bonaparte. 3 males and 3 females from the type host from Spain in Meinertzhagen collection (British Museum (Nat. Hist.)).



FIGS. 51–56.—*Brüelia deficiens*. (51) Male; (52) male genitalia; (53) paramere; (54) mesosomal plate; (55) terminal segments of female; (56) vulvar chaetotaxy.

Three males and 13 females from *Aphelocoma c. californica* from California; 9 males and 30 females from *Cyanocitta stelleri frontalis* from California in Meinertzhagen collection were found to be indistinguishable from *Brüelia deficiens*. Some

specimens had slightly narrower heads but this was not found to be a regular feature in all the specimens from the same host.

One male and two females (syntypes) of *Brüelia ampullata* (Piaget) in Piaget's collection from *Cyanopica cyanus cooki* were critically compared with *Brüelia deficiens* and found to agree with it in all respects. These two names were published in the same publication and *deficiens* has page priority.

Lectotype of *Brüelia deficiens* (Piaget) : ♂ in the Piaget Collection (British Museum (Nat. Hist.)), slide no. 1237.

Lectotype of *Brüelia ampullatus* (Piaget) : ♂ in the Piaget Collection (British Museum (Nat. Hist.)), slide no. 1180.

Brüelia zavattariornis sp. nov.

(Text-figs. 57–62)

This species is very similar to *Brüelia deficiens* (Piaget) and is difficult to distinguish on a superficial examination. A segment to segment examination, however, shows that the following characters warrant its separation. The male has a narrower head ; other measurements also tend to be smaller ; the chaetotaxy is of a distinct pattern ; the genitalia are similar, but in this species the parameres are shorter.

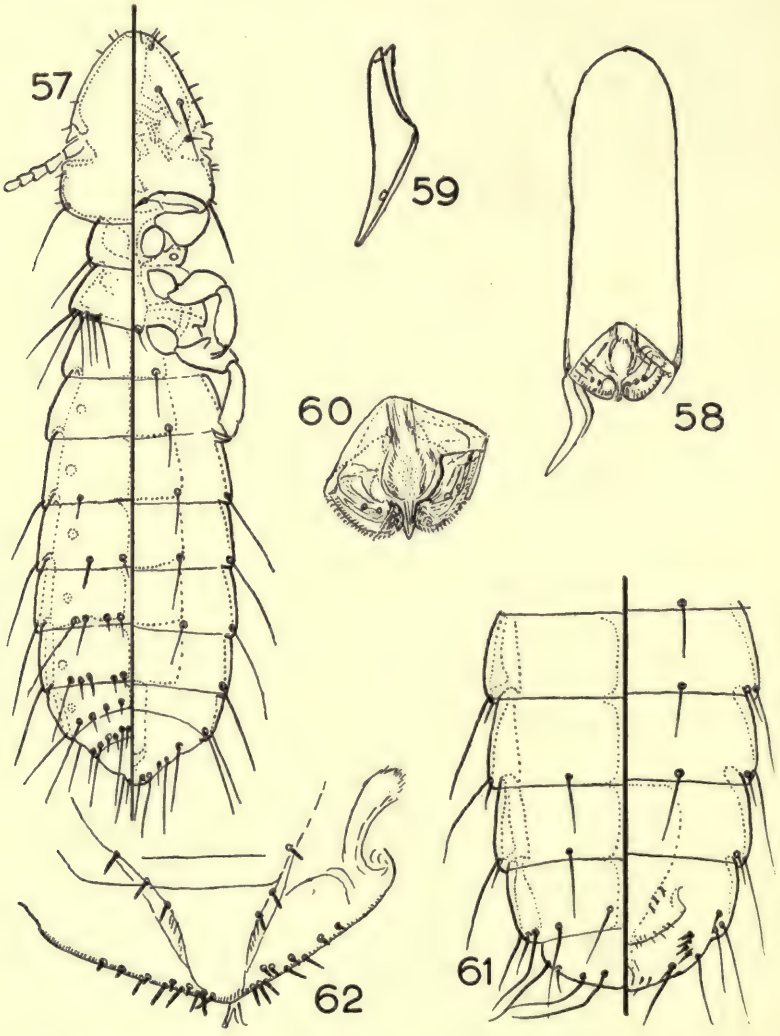
Abdominal Chaetotaxy

	Male (holotype).			Female (allotype).		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	6+6	1+1	—	6+6	1+1	—
Abdomen :						
II	0+0	1+1	0+0	0+0	1+1	0+0
III	0+0	1+1	0+0	0+0	1+1	0+0
IV	1+1	1+1	1+1	0+0	1+1	1+1
V	1+1+1+1	1+1	1+1	0+0	1+1	1+1
VI	2+2+2+2	1+1	2+1	1+1	1+1	1+1
VII	1+4+4+1	0+0	1+1	1+1	0+0	2+2
VIII	1+3+3+1	0+0	2+2	1+1+1+1	0+0	3+3
IX	1+2+1+1+1+1+3+1	0+0	2+2	1+2+2+1	0+0	3+3
X–XI	1+1	0+0	2+3	—	—	—
				Vulva 10+9–10		

Measurements (mm.)

	Male (holotype).	Female (allotype).
Head : pre-antennal	0·184×0·246	0·191×0·281
hind head	0·157×0·274	0·177×0·315
Prothorax	0·082×0·184	0·082×0·191
Pterothorax	0·116×0·267	0·150×0·301
Abdomen	0·891×0·377	1·164×0·507
L : B pre-antennal	1 : 1·34	1 : 1·47
L : B hind head	1 : 1·74	1 : 1·83
Cephalic index	1 : 0·80	1 : 0·85

Female is similar to *B. deficiens* but is smaller. No other reliable characters could be detected to separate the two allied forms.



FIGS. 57–62.—*Brüelia zavattariornis* sp. nov. (57) Male; (58) male genitalia; (59) paramere; (60) mesosomal plate; (61) terminal segments of female; (62) vulvar chaetotaxy.

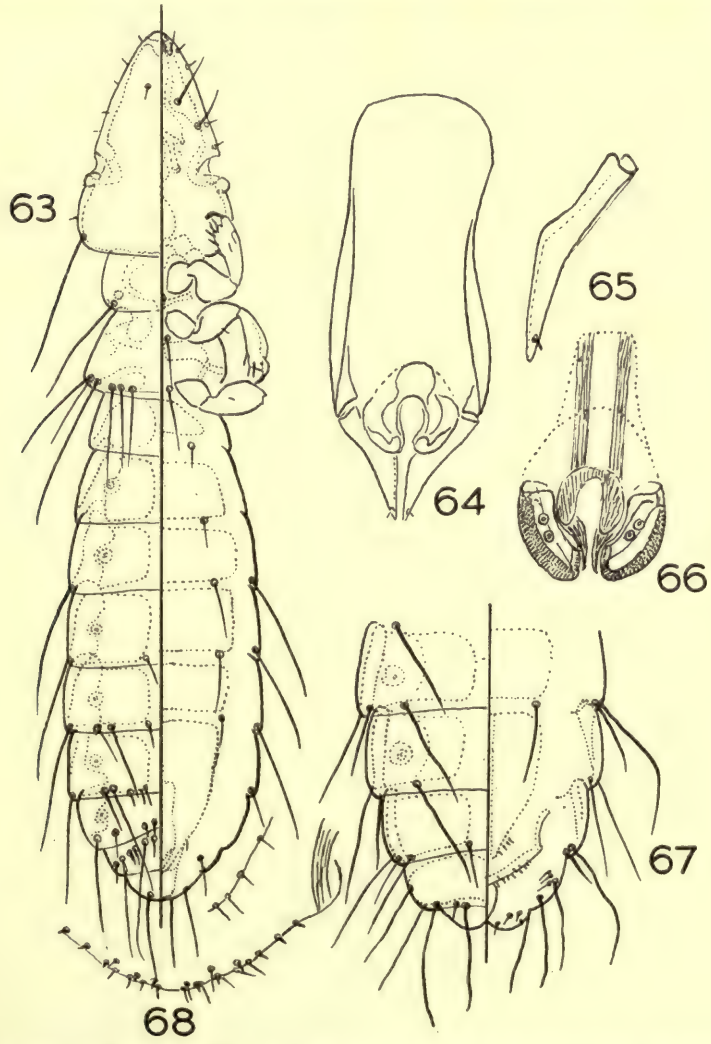
MATERIAL EXAMINED. 8 males and 21 females from *Zavattariornis stressemanni* Moloni from Yavallo, South Abyssinia. *Holotype* (male), *allotype* (female) on slide number 16129 in Meinertzhagen collection (British Museum (Nat. Hist.)) from *Zavattariornis stresemanni*. *Paratypes* 7 males and 20 females from type host, same data as above.

Brüelia zohrae sp. nov.

(Text-figs. 63–68)

This species is similar to *Brüelia deficiens* (Piaget) and *B. zavattariornis* sp. nov., from both of which it can be easily separated by its pointed wedge-shaped head and dorsal abdominal chaetotaxy.

MALE. Head with acutely pointed forehead. Marginal carina indented medially and the anterior margin at this point hyaline. Tergal plates squarish and approximated sternal plates transverse. The dorsal abdominal hairs delicate. It is often



FIGS. 63–68.—*Brüelia zohrae*. (63) Male; (64) male genitalia; (65) paramere; (66) mesosomal plate; (67) terminal segments of female; (68) vulvar chaetotaxy.

difficult to ascertain the position of a hair if lost, because the pustules are not very conspicuous.

FEMALE. Similar to the male but differs in measurements and abdominal chaetotaxy.

Abdominal Chaetotaxy

		Male (holotype).			Female (allotype).		
		Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax		6+6	1+1	—	6+6	1+1	—
Abdomen	II	0+0	1+1	0+0	0+0	1+1	0+0
	III	0+0	1+1	0+0	0+0	1+1	1+1
	IV	0+0	1+1	2+2	0+0	1+1	2+2
	V	1+1	1+1	2+2	1+1	1+1	2+2
	VI	2+1–2+1–2+2	1+1	2+2	1+1	1+1	2+2
	VII	2+4+3+2	0+0	1+1	1+1	0+0	3+3
	VIII	1+3+3+1	0+0	1+1	1+1+1+1	0+0	2+2
	IX	5–6+5	—	—	3+3	0+0	3+3
	X–XI	See Text-fig.	See Text-fig.		—	—	—
					Vulva : 10+9–11		

Measurements (mm.)

	Male (holotype).	Female (allotype).
Head : pre-antennal	0·226×0·281	0·212×0·308
hind head	0·171×0·369	0·177×0·383
Prothorax	0·096×0·294	0·103×0·308
Pterothorax	0·131×0·363	0·177×0·411
Abdomen	0·917×0·424	1·177×0·514
L : B pre-antennal	1 : 1·24	1 : 1·45
L : B hind head	1 : 2·15	1 : 2·15
Cephalic index	1 : 0·93	1 : 0·98

MATERIAL EXAMINED. 2 males and 8 females from *Philostomus afer* (Linn.) from Portuguese Guinea. *Holotype* (male) and *allotype* (female) on slide no. 4064 in Meinertzhagen collection from *Philostomus afer*. *Paratypes* one male and 7 females from the same host (data above).

This species is named after my wife, who was responsible for my stay in London, and ungrudgingly shouldered the responsibilities of the children during my time in Europe.

Brüelia biguttata (Kellogg & Paine), 1914

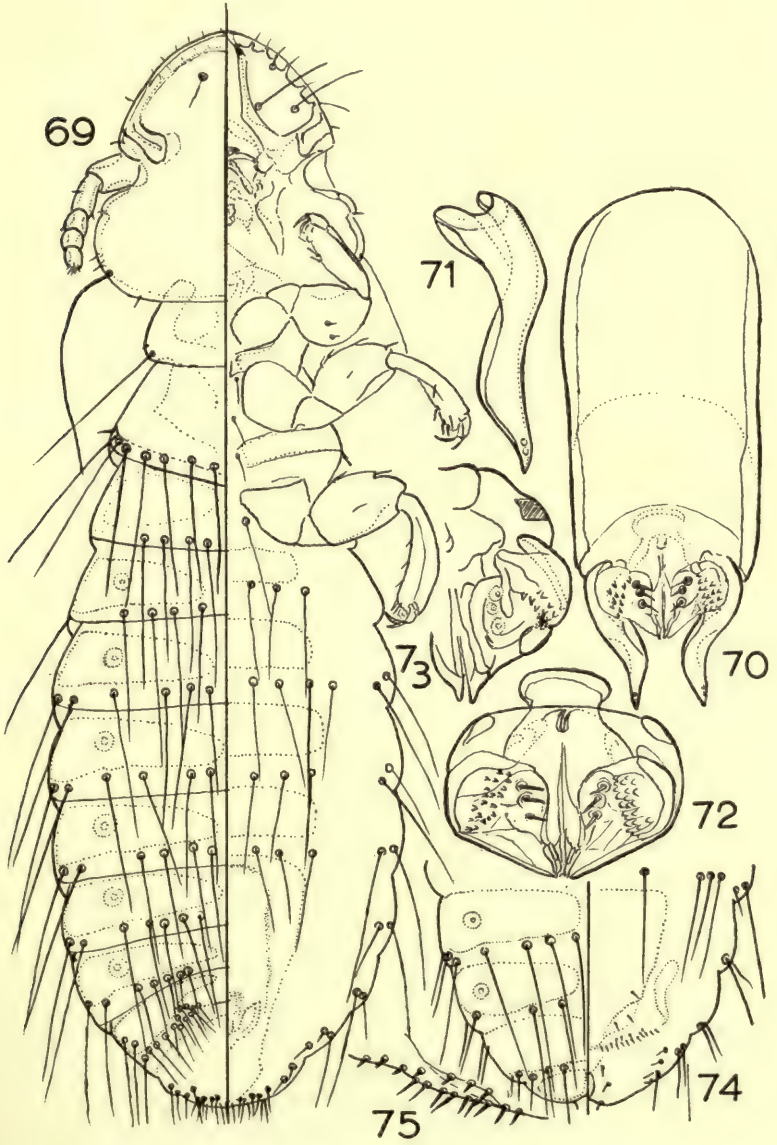
(Text-figs. 69–75)

Nirmus biguttatus Kellog & Paine, 1914, *Rec. Ind. Mus.* **10** : 234, pl. 14, fig. 2.

Type host : *Pyrrhocorax g. graculus* (Linn).

MALE. Pre-antennal region with marginal carina entire. Ventral carina sclerotized only proximally. Basal antennal segment robust, about 1·5 times as broad as the segment before.

Pterothorax with 7–8 elongate setae on the dorsal posterior margin on each side. Segments II–IX with approximate tergal plates. Sternal plates II–V well sclerotized. Terminal margin with 13–14 long hairs. Genitalia with basal plate about three times as long as mesosome and 2·5 times as long as its distal width.



FIGS. 69–75.—*Brüelia biguttata*. (69) Male; (70) male genitalia; (71) parameres; (72–73) two different aspects of mesosomal plate; (74) terminal tegments of female; (75) vulvar chaetotaxy.

FEMALE. Similar to the male. Basal antennal segment almost half the size of the corresponding segment in male. Genital plate with 3–4 minute spines. Vulva with 15–16 short marginal spines arranged in two irregular rows.

Abdominal Chaetotaxy

	Male.			Female, slide no. 822.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	8–9+8–9	2+2	—	7–8+7–8	1+1	—
Abdomen :						
II	1+2–3+3+1	2+2	0+0	1+2+2+1	1+1	0+0
III	1+3+3+1	2+3–4	1+1	1+2+2+1	1+2+2+1	1+1
IV	1+3+3+1	1+2+2+1	2+2	1+2+2+1	1+1+1+1	2+2
V	1+3–4+4+1	1+2+2+1	2+2	1+2+2+1	2+1+1+2	2+2
VI	1+4+4+1	1+1+1+1	2+2–3	1+3+3+1	3+1+1+4	3+3
VII	1+4–6+6+1	0+0	3+3	1+3+3+1	1+0+0+0	3+3
VIII	5+5	0+0	3+3	1+2+2+1	0+0	3+3
IX	10+9	0+0	3+3	3+0+0+3	0+0	5+5
X–XI	See Text-fig.			—	—	—
				Vulva : 15+16 marginal hairs.		

Measurements (mm.)

	Male (lectotype).	Female, slide no. 822.
Head : pre-antennal	0·198×0·377	0·212×0·383
hind head	0·274×0·472	0·246×0·445
Prothorax	0·116×0·293	0·096×0·260
Pterothorax	0·191×0·431	0·205×0·404
Abdomen	1·075×0·623	1·061×0·630
L : B pre-antennal	1 : 1·90	1 : 1·81
L : B hind head	1 : 1·72	1 : 1·80
Cephalic index	1 : 1·0	1 : 0·97

MATERIAL EXAMINED. 2 male syntypes, Kellogg collection, Indian Museum, Calcutta. 5 males and 10 females from the type host, *Pyrrhocorax g. graculus* (Linn.) from Khambajon (Tibet) and Pyrenees.

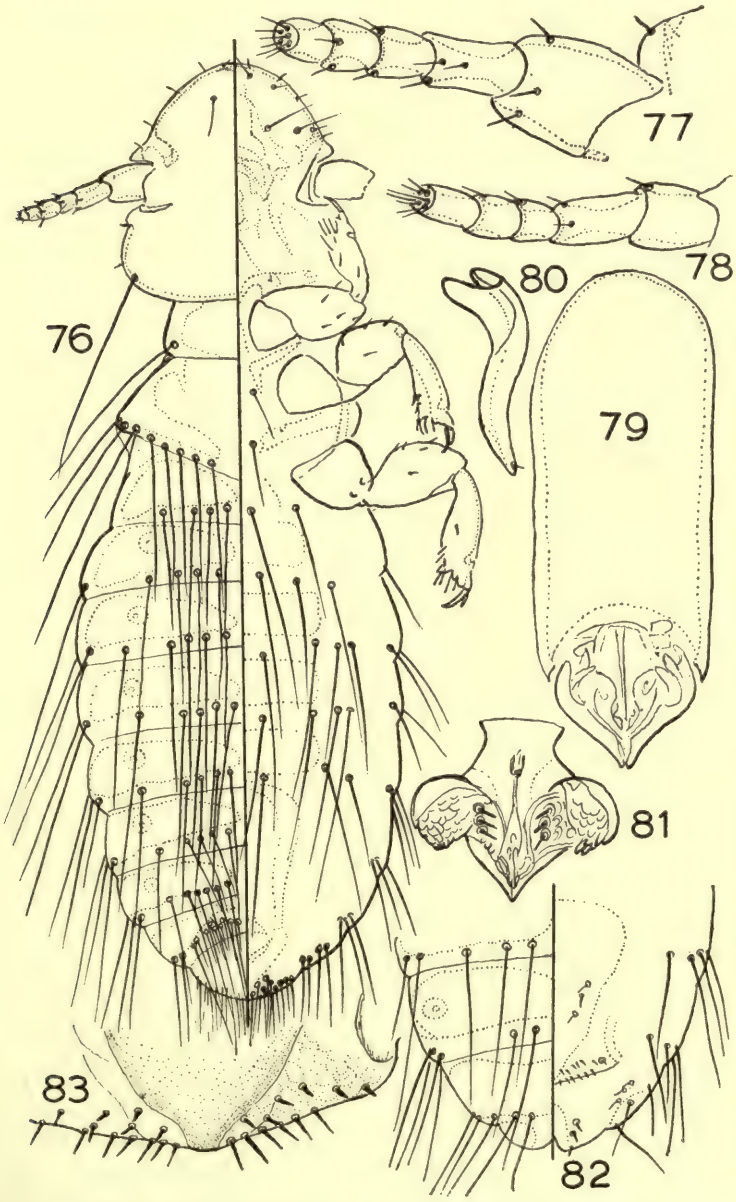
LECTOTYPE. 1 male on slide no 513/16 in Indian Museum, Calcutta.

Material collected from *Pyrrhocorax p. pyrrhocorax* from Pyrenees and Crete, *Pyrrhocorax p. himalayanus* from Afghanistan and *Pyrrhocorax p. pontifex* from East Persia in Meinertzhagen collection is indistinguishable from *Brüelia biguttata* (Kellogg & Paine). Some of the specimens show marked differences in the shape of the head, abdominal chaetotaxy and total length, but there are intermediate forms showing that this species exhibits an unusually large range of variation. The form described below shows constant differences which warrant its description as a new sub-species of *Brüelia biguttata* (Kellogg & Paine).

Brüelia biguttata docilis subsp. nov.

(Text-figs. 76–83)

MALE. Similar to *Brüelia biguttata* (Kellogg & Paine) but the head is of slightly smaller size, marginal carina comparatively narrower, ventral carina sclerotized as



FIGS. 76–83.—*Brüelia biguttata* subsp. *docilis*. (76) Male; (77) male antenna; (78) female antenna; (79) male genitalia; (80) paramere; (81) mesosomal plate; (82) terminal segments of female; (83) vulvar chaetotaxy.

far as the middle of the pre-antennal region. The genitalia with proportionately smaller parameres.

FEMALE. Similar to *Brüelia biguttata*, but differs in abdominal chaetotaxy.

Abdominal Chaetotaxy

	Male.			Female.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Ptero-thorax	8+8	1+1	—	7+7	1+1	—
Abdomen :						
II	1+3+3+0	1+1+1–1	0+0	1+3+3+1	1+1	0+0
III	1+4+5+1	1+2+2+1	1+1	1+3+3+1	1+4+4+1	1+1
IV	1+4–5+4+1	2+3+3+2	2+2	1+3+3+1	1+2+2+1	2+2
V	1+4+4+1	1+2+2+1	2+2	1+3+3+1	1+2+2+1	3+3
VI	1+4+4+1	1+2+2+1	3+3	1+2–3+2–3+1	3+4+3+4	3+3
VII	1+4–5+4–5+1	0+0	3+3	1+3+3+1	0+0	3+2
VIII	1+4–5+5+1	0+0	3+3	0–1+2–3+2–3+1–0	0+0	3+3
IX	1+11+10+1	0+0	3+3	3+3	0+0	4–5+4–5
X–XI	—	—	14+19	—	—	—
				Vulva 12+12		

Measurements (mm.)

	Male (holotype).	Female (allotype).
Head : pre-antennal	0·171×0·328	0·219×0·363
hind head	0·253×0·411	0·274×0·411
Prothorax	0·103×0·253	0·103×0·239
Pterothorax	0·137×0·404	0·177×0·411
Abdomen	1·007×0·589	1·500×0·630
L : B pre-antennal	1 : 1·91	1 : 1·66
L : B hind head	1 : 1·62	1 : 1·50
Cephalic index	1 : 0·97	1 : 0·83

MATERIAL EXAMINED. 22 males and 31 females from *Pyrrhocorax p. docilis* (Gmelin) in Meinertzhagen collection (British Museum (Nat. Hist.)). *Holotype* (male) and *allotype* (female) on slide no. 12439 from *Pyrrhocorax p. docilis* from Morocco in Meinertzhagen collection. *Paratypes* 21 males and 30 females from the same host (data above).

Brüelia koslovae (Clay,) 1936

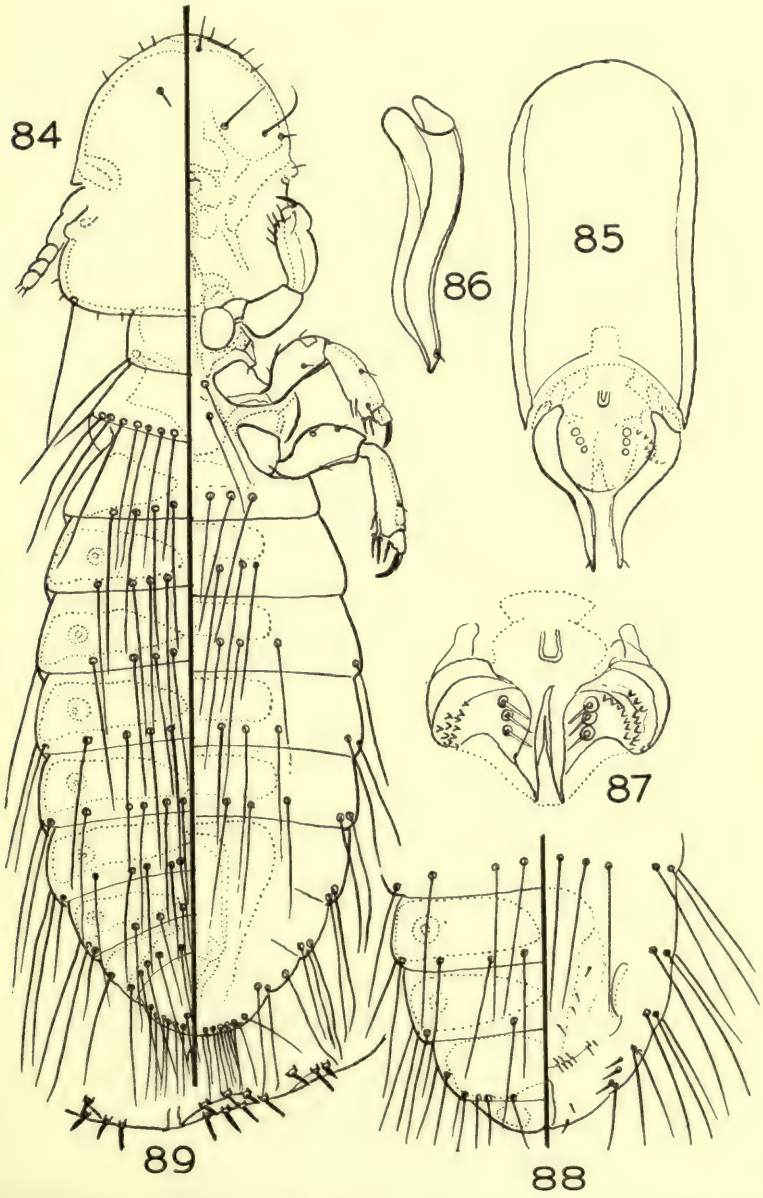
(Text-figs. 84–89)

Degeeriella koslovae Clay, 1936, *Proc. zool. Soc. Lond.* **1935** : 908, pl. 1, fig. 3.

Type host : *Podoces biddulphi* Hume.

This species is similar to *Brüelia biguttatus* (Kellogg & Paine) from which it can be easily distinguished by the longer forehead and male genitalia. The abdominal chaetotaxy is more or less the same. In the female the vulva is fringed with 8–9 hairs as against 15–16 in *B. biguttata*.

MALE. Marginal carina moderately sclerotized and runs inwards along the rounded margin in the middle. Ventral carina sclerotized only proximally. Tergal plates II–IX well developed, interrupted in the middle ; sternal pates II–VI distinct, confined to the middle. Genitalia as shown in the Text-figs. 85–87.



FIGS. 84–89.—*Brüelia koslovae*. (84) Male ; (85) male genitalia ; (86) paramere ; (87) mesosomal plate ; (88) terminal segments of female ; (89) vulvar chaetotaxy.

FEMALE. Similar to the male, but differs in measurements and chaetotaxy. The marginal hairs on vulva tend to be less than in allied species.

Abdominal Chaetotaxy

	Male (type).			Female.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	9+9	1+1	—	8+8	1+1	—
Abdomen II	1+3+3+1	3+3	0+0	1+2+2+1	3+3	0+0
III	1+3+3+1	3+3	1+1	1+3+3+1	3+3	1+1
IV	1+2+2+1	3+3	1+1	1+3+3+1	3+3	3+2
V	1+3+3+1	3+3	2+2	1+2+2+1	3+3	2+2
VI	1+4+3+1	3+3	3+3	1+2+3+1	3+3	3+3
VII	1+4+4+1	0+0	2+2	1+2+2+1	0+0	3+3
VIII	3+3	0+0	3+3	2+2	0+0	3+3
IX	4+4	0+0	2+2	3+3	0+0	4+4
X–XI	9+10	See Text-fig.		—	—	—

Vulva 8+9 hairs.

Measurements (mm.)

	Male (type).	Female.
Head : pre-antennal	0·253×0·391	0·261×0·397
hind head	0·239×0·479	0·261×0·486
Prothorax	0·103×0·246	0·103×0·246
Abdomen	0·151×0·377	0·171×0·383
L : B pre-antennal	1·131×0·554	1·253×0·596
L : B hind head	1 : 1·54	1 : 1·52
Cephalic index	1 : 2·01	1 : 1·97
	1 : 0·97	1 : 0·93

MATERIAL EXAMINED : One male (type) on slide no. 2994, 9 males and 13 females (paratypes) from *Podoces biddulphi* Hume from Kashgaria and East Turkistan, and 4 males and 6 females from *Podoces hendersoni* from Mongolia in Meinertzhagen collection (British Museum (Nat. Hist.)).

Brüelia biocellata (Piaget), 1880

(Text-figs. 90–93)

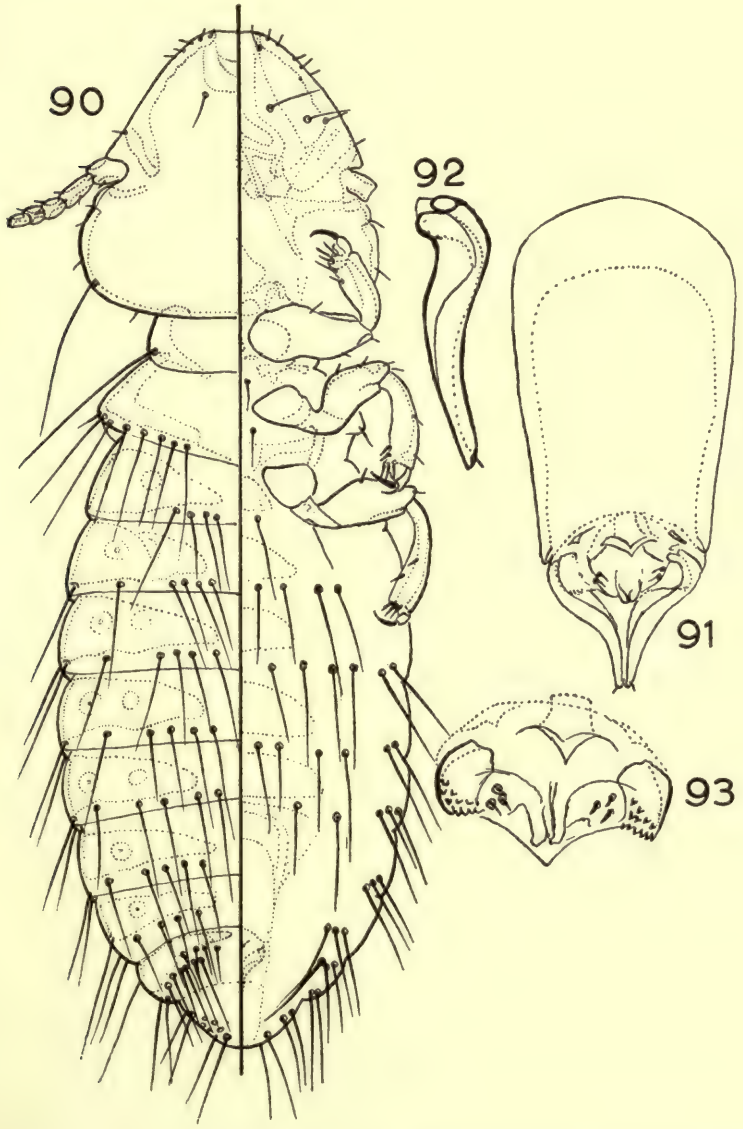
Nirmus biocellata Piaget, 1880, *Pédiculines*, **666**, pl. 55, fig. 2.

Type host : *Pica pica leucoptera* Gould.

MALE. Marginal carina highly sclerotized, interrupted in the anterior part; anterior margin hyaline and concave in front; ventral carina forming a distinct

band anteriorly. Basal antennal segment robust and twice as long as the conus. Genitalia as shown in Text-figs. 91–93.

FEMALE. No female from the type host was available. Females from *Pica pica hudsonia* are similar to the male with considerable variation in abdominal chaetotaxy.



FIGS. 90–93.—*Brüelia biocellata.* (90) Male ; (91) male genitalia ; (92) paramere ; (93) mesosomal plate.

Abdominal Chaetotaxy

	Male.			Female.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	9+8	1+1	—	8+8	1+1	—
Abdomen :						
II	3+3	2+2	0+0	3+4	3+3	0+0
III	1+4+4+1	2+2+2+2	1+1	1+4+3+1	2–3+2–3	1+1
IV	1+4+4+1	2+2+2+2	2+2	1+4+4+1	2+2	2+2
V	1+4+4+1	2+2+2+2	2+2	1+4+3+1	1+2+1+2	2+2
VI	1+3–5+4–5+1	2+2	3+3	1+4+4+1	1+1	2+2
VII	1+3–5+5+1	0+0	3+3	1+3+3+1	0+0	2+2
VIII	1+4–5+4–5+1	0+0	3–4+3–4	2+2	0+0	3+3
IX	10+10	0+0	—	2+2	0+0	4+4
X–XI	See Text-fig.			—	—	—

Vulva : 17+18 short hairs.

Measurements (mm.)

	Male (type).	Female.
Head : pre-antennal	0·233×0·445	0·267×0·479
hind head	0·274×0·500	0·294×0·576
Prothorax	0·131×0·308	0·109×0·315
Pterothorax	0·157×0·466	0·219×0·514
Abdomen	1·212×0·657	1·452×0·733
L : B pre-antennal	1 : 1·91	1 : 1·79
L : B hind head	1 : 1·82	1 : 1·95
Cephalic index	1 : 0·98	1 : 1·03

MATERIAL EXAMINED. Piaget's collection: one male (type) from *Pica pica leucoptera* Gould. No reliable characters could be discovered to separate 8 males, 2 females from *Pica pica hudsoni*, 4 males, 4 females from *Pica pica nuttalli* from California, 34 males, 30 females from *Pica pica bactriana* from Kabul and Ladakh, one female from *Pica pica sericea* from China.

Two males of *Brüelia nigropicta* (Carriker) (marked paratypes) from *Pica pica hudsonia* (Sabine) from Nebraska in the Hopkins collection were also compared with the *B. biocellata* type and were found to agree in all respects (see also Hopkins and Clay, 1952 : 59).

Brüelia multipunctata (Clay), 1936

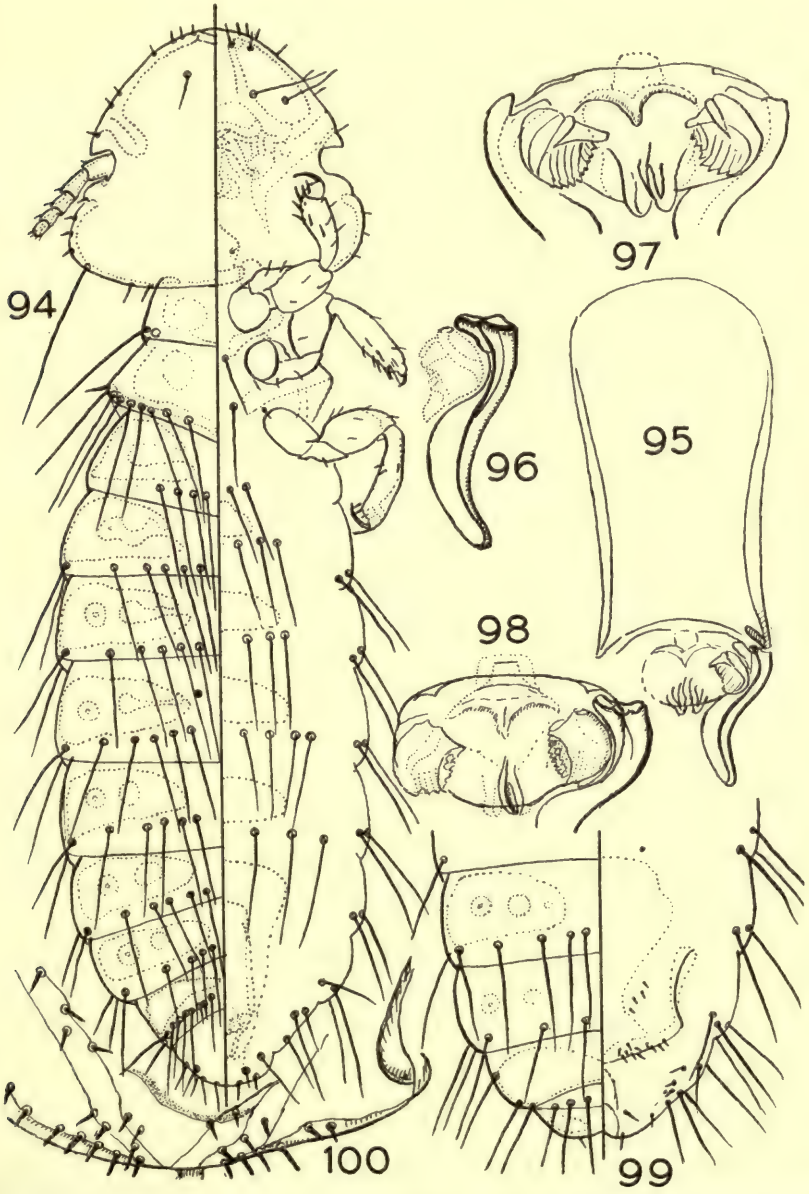
(Text-figs. 94–100)

Degeeriella multipunctata Clay, 1936, *Proc. zool. Soc. Lond.* **1935** : 906, pl. 1, fig. 2.

Type host: *Nucifraga caryocatactes multipunctata* Gould.

This species is similar to *Brüelia olivacea* (Burmeister), the female of which (the male was not available for comparison) has comparatively fewer hairs on the abdomen and a narrower genital plate.

MALE. Marginal carina complete, but less heavily sclerotized in the middle and with hyaline margin. Tergal plates interrupted in the middle, well developed on segment II–IX. Sternal plates II–V well formed and confined to the middle. Genital



FIGS. 94–100.—*Brüelia multipunctata*. (94) Male ; (95) male genitalia ; (96) paramere ; (97–98) two different aspects of mesosomal plate ; (99) terminal segments of female ; (100) vulvar chaetotaxy.

plate on segment VI–IX. Abdominal chaetotaxy very constant. Male genitalia as shown in the Text-figs. 95–97.

FEMALE. Similar to the male with slight differences in abdominal chaetotaxy and general body measurements.

Abdominal Chaetotaxy

	Male (type).			Female.		
	Tergal.	Sternal.	Pleural.	Tergal.	Sternal.	Pleural.
Pterothorax	8+8	1+1	—	7+8	1+1	—
Abdomen II	4+4	2+2	0+0	3+4	3+3	0+0
III	1+4+4+1	3+3	1+1	1+3+3+1	4+4	2+2
IV	1+4+4+1	3+3	2+2	1+4+4+1	4+4	3+3
V	1+4+4+1	4+4	2+2	1+3+3+1	3+3	3+3
VI	1+4+4+1	3+3	2+2	1+3+3+1	3+3	3+3
VII	1+4+4+1	0+0	3+3	1+2+2+1	0+0	3+3
VIII	1+4+4+1	0+0	2+2	2+2	0+0	3+3
IX	7+6	0+0	2+2	3+3	0+0	4+4
X–XI	See Text-fig.			—	—	—

Vulva : 9+11 hairs.

Measurements (mm.)

	Male (type).	Female.
Head : pre-antennal	0·212×0·438	0·239×0·465
hind head	0·264×0·541	0·253×0·561
Prothorax	0·123×0·260	0·116×0·281
Pterothorax	0·164×0·417	0·184×0·459
Abdomen	1·137×0·582	1·438×0·616
L : B pre-antennal	1 : 2·06	1 : 1·90
L : B hind head	1 : 2·09	1 : 2·11
Cephalic index	1 : 1·18	1 : 1·14

MATERIAL EXAMINED. One male type (slide no. 778), 2 males and 6 females (paratypes) from *Nucifraga caryocatactes multipunctata* Gould from Kashmir in Meinertzhagen collection (British Museum (Nat. Hist.)).

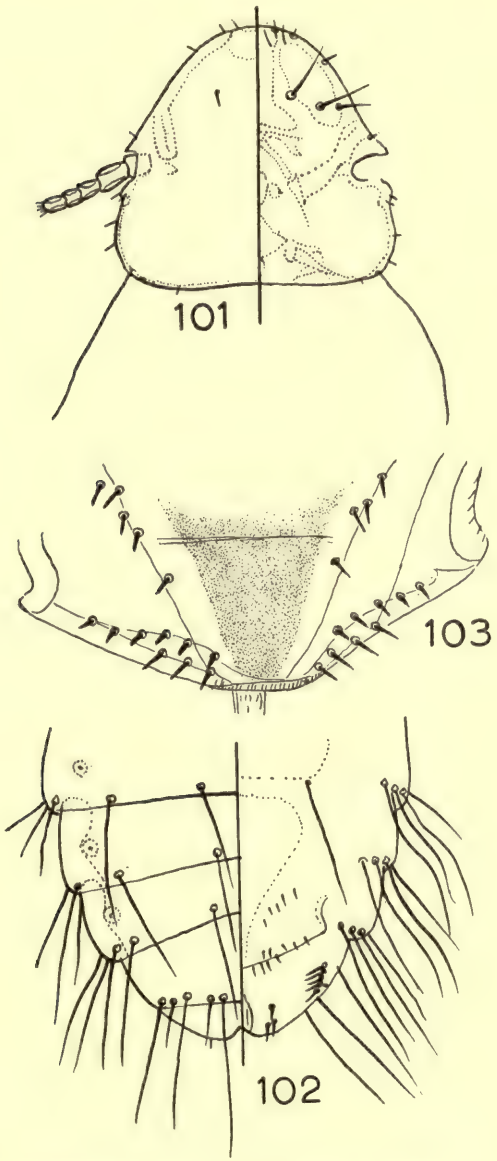
Brüelia olivacea (Burmeister), 1938

(Text-figs. 101–103)

Nirmus olivacea Burmeister, 1838, *Handb. Ent.* **2** : 431.

Type host : *Nucifraga c. caryocatactes* (Linn.).

Unfortunately no male specimens were available. One female from the type-host was very similar to *Brüelia multipunctata* (Clay), but could be easily distinguished by the abdominal chaetotaxy and genital plate.



FIGS. 101–103.—*Brüelia olivacea*. (101) Head of female; (102) terminal segments of female; (103) vulvar chaetotaxy.

Abdominal Chaetotaxy

	Female.		
	Tergal.	Sternal.	Pleural.
Pterothorax . . .	8+8	1+1	—
Abdomen II . .	1+1	1+1	0+0
III . .	1+1	1+1	0+0
IV . .	1+1+1+1	1+1	3+3
V . .	1+1+1+1	1+1	3+3
VI . .	1+1+1+1	1+1	3+3
VII . .	1+1+1+1	0+0	4+4
VIII . .	1+1+1+1	0+0	4+4
IX . .	See Text-fig.	—	—
Vulva	9+9 marginal hairs.	—	—

Measurements (mm.) : Length × breadth.

	Female.
Pre-antennal region . .	0·233×0·438
Hind head . . .	0·267×0·507
Prothorax	0·130×0·294
Pterothorax . . .	0·308×0·472
Abdomen	1·131×0·692
L : B pre-antennal . .	1 : 1·88
L : B hind head . .	1 : 1·89
Cephalic index . . .	1 : 1·01

MATERIAL EXAMINED. One female from type host (*Nucifraga c. caryocatactes* (Linn.)) from Germany in the British Museum (Nat. Hist.) collection.

Brüelia hamatofasciata (Piaget), 1890

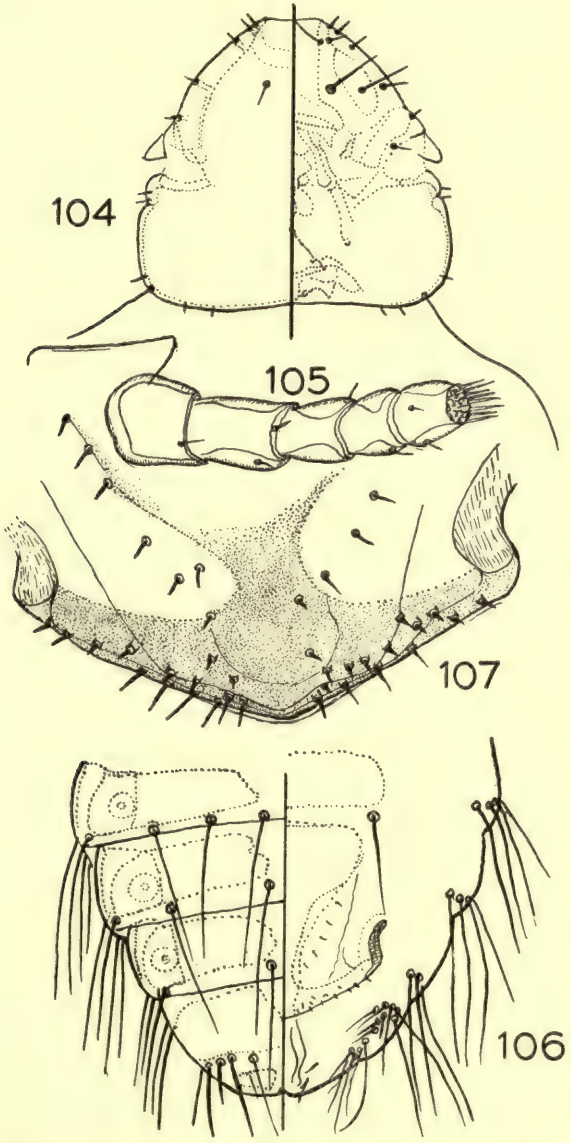
(Text-figs. 104–107)

Docophorus hamatofasciata Piaget, 1890, *Tijdschr. Ent.* **33** : 225, pl. 8, fig. 3.

Type host : (*Penelopides manilae* error) Probably some member of the Corvidae.

Piaget (1890) described this species from a female from *Penelopides mamilae.* The type specimen now in the British Museum Collection, shows that it is a *Brüelia* species of the type infesting the Corvidae.

In the female (type) the marginal carina is interrupted medially, with the anterior plate well developed. Ventral carina is sclerotized proximally. Tergal plates II–VIII interrupted in the middle and plate IX is entire. Chaetotaxy as given in the table below.



FIGS. 104–107.—*Brüelia hamatofasciata*. (104) Female; (105) female antenna; (106) terminal segments of female; (107) vulvar chaetotaxy.

Abdominal Chaetotaxy

	Female (type).		
	Tergal.	Sternal.	Pleural.
Pterothorax . . .	8+10	1+1	—
Abdomen II . .	1+1	1+1	1+1
III . .	1+1	1+1	1+1
IV . .	1+1+1+1	1+1	2+2
V . .	1+1+1+1	1+1	3+3
VI . .	1+1+1+1	1+1	4+4
VII . .	1+1+1+1	0+0	4+4
VIII . .	1+1	0+0	4+4
IX . .	3+3	0+0	See Text-fig.
Vulva	14+15 Marginal hairs	—	—

Measurements (mm.)

	Female.
Pre-antennal region . .	0·246×0·445
Hind head . . .	0·281×0·561
Prothorax	0·116×0·349
Pterothorax . . .	0·253×0·582
Abdomen	1·212×0·794
L : B pre-antennal . .	1 : 1·81
L : B hind head . .	1 : 1·99
Cephalic index . . .	1 : 1·06

This form is similar to that from *Pica p. nuttali*, from which it can be easily distinguished by the abdominal chaetotaxy, pigmentation of ventral carina and genital plate.

It will probably be useful to know that Piaget collected Mallophaga from the following Corvidae : *Pica p. pica* and *Pica p. leucoptera* (Gould) when he described the species under consideration.

MATERIAL EXAMINED. Piaget's collection one female (type) in British Museum (Nat. Hist.).

SUMMARY

All the known species of *Brüelia* from Corvidae other than *Corvus* species are discussed, two sub-species and six new species are described. The species of previous authors are redescribed and figured.

LIST OF SPECIES DISCUSSED

(*Type host in bold type and synonyms in brackets*)

1. *Brüelia biguttata* (Kellog & Paine), 1914.
   Pyrrhocorax g. graculus.
   Pyrrhocorax p. pyrrhocorax.
   Pyrrhocorax p. pontifex.
   Pyrrhocorax p. himalayanus.

2. *Brüelia biguttata docilis* new subspecies.
   Pyrrhocorax p. docilis.

3. *Brüelia biocellata* (Piaget), 1880.
   Pica p. leucoptera.
   Pica p. hudsonia.
   Pica p. nuttalli.
   Pica p. bactriana.
   Pica p. sericea.

   (*Brüelia nigropicta* (Carriker), 1902.)
   Pica p. hudsonia.

4. *Brüelia clayae* new species.
   Cyanocitta cristata cristata.

5. *Brüelia deficiens* (Piaget), 1885.
   Cyanopica cyanus cooki.
   Aphelocoma c. californica.
   Cyanocitta stelleri frontalis.

   (*Brüelia ampullata* (Piaget), 1885.)
   Cyanopica cyanus cooki.

6. *Brüelia glandarii* (Denny), 1842.
   Garrulus g. rufitergum.
   Garrulus g. glandarius.
   Garrulus g. theresae.
   Garrulus g. krynicki.

7. *Brüelia glandarii perisoreus* new subspecies.
   Perisoreus i. infaustus.

8. *Brüelia hamatofasciata* (Piaget), 1890.
   (*Penelopides manilae* (error)).

9. *Brüelia hopkinsi* new species.
   Xanthoura yncas galeata.

10. *Brüelia husaini* new species.
    Urocissa flavirostris cuculata.
    Urocissa melanocephala occipitalis.

11. *Brüelia koslovae* (Clay), 1936.
    Podoces biddulphi.
    Podoces hendersoni.

12. *Brüelia meinertzhageni* new species.
    Dendrocitta rufa vagabonda.

13. *Brüelia multipunctata* (Clay), 1936.
Nucifraga caryocatactes multipunctata.

14. *Brüelia nitzschi* Kéler, 1938.
Cyanocorax cyanomelas.

15. *Brüelia olivacea* (Burmeister), 1838.
Nucifraga c. caryocatactes.

16. *Brüelia zavattariornis* new species.
Zavattariornis stresemanni.

17. *Brüelia zohrae* new species.
Philostomus afer.

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A REVISION OF THE GENUS *TRIDREPANA* SWINHOE (LEPIDOPTERA : DREPANIDAE)

By ALLAN WATSON

SYNOPSIS

In the following paper all previously known species of the genus have been redescribed, eleven new species and eleven new subspecies have been described and various taxonomic problems unravelled.

Drawings of the genitalia of each species have been given, where possible of both sexes. Photographs of the upperside of the whole insect have been prepared for those species which have not been satisfactorily photographed or otherwise illustrated before and for eight of the new species.

INTRODUCTION

History

The genus was created by Swinhoe (1895) for part of Hampson's (1893) Section III of *Drepana* Schrank. Swinhoe included *Drepana albonotata* Moore, *D. sadana* Moore, *D. xanthoptera* Hampson and *D. vira* Moore but did not designate a type species.

Warren (1896) added *Tridrepana septempunctata, T. argentistriga* and *T. trisulcata*; (1897) *T. subobliqua* and *T. diluta*; (1903) *T. fulvata* ab. *olivacea* and *fulvata* ab. *fasciata*. Swinhoe (1905) added *adelpha*. It may be noted here that Nagano (1917) created a monotypic genus *Konjikia* with type species *D. crocea* Leech to which Matsumura (1921) added *arikana*.

In the revision of the Indo-Australian species of the genus, Warren (1922) cited the generic name as *Iridrepana* (*sic*): this can be regarded as an erroneous subsequent spelling. Warren designated *D. albonotata* Moore as the type species and listed the following species: *T. falcipennis* Warren, *D. fulvata* Snellen, *T. semirufa* Warren (including *T. semirufa elegans* Warren), *T. examplata* Warren, *T. cervina* Warren, *T. tristigma* Warren, *D. sera* Warren, *T. septempunctata* Warren (including *T. septempunctata pervasata* Warren), *D. rubromarginata* Leech, *T. obliquitaenia* Warren, *D. sadana* Moore, *T. adelpha* Swinhoe, *D. fulva* Hampson, *D. flava* Moore, *D. postica* Moore, *Agnidra ferrea* Hampson, *T. melliflua* Warren, *T. argentistriga* Warren, *D. quadripunctata* Walker, *T. diluta* Warren, *T. subobliqua* Warren, *T. trisulcata* Warren, *T. trilinearia* Warren, *T. glaciata* Warren and *T. mediata* Warren. He also correctly sank *xanthoptera* Hampson to *postica* Moore and raised *olivacea* Warren and *fasciata* Warren to specific rank: *vira* Moore he removed to *Albara* Walker.

Gaede (1931) listed all those species mentioned by Warren (1922) but relegated to infrasubspecific level *T. fasciata* Warren and *T. olivacea* Warren which became " abberations " of *fulvata* Snellen, and *T. septempunctata pervasata* Warren which became a " variety " of *septempunctata* Warren. He also sank *Callidrepana ochrea* Butler to *D. albonotata* Moore (correctly) and *C. lunulata* Butler to *D. fulvata* (incorrectly) ; no mention was made of *T. semirufa elegans* Warren.

Bryk (1943) added *T. glaciata aurorina* and *T. adelpha matronalis*.

Treatment

As the relevant literature has not been adequately summarized previously, the bibliographies have been made to include all references of nomenclatural importance.

The diagnosis placed below each description is purely differential and distinguishes the taxon from others with which it is likely to be confused. Where a species is polytypic, a species diagnosis is given after the description of the subspecies placed first in the text (usually the nominate race).

Measurements are recorded in the following form : (a) mean wing-span (twice distance between apex of fore wing and centre of the thorax), (b) range of measurements of wing span, and (c) number of specimens measured.

Where areas of colour were large enough to allow an accurate assessment, they have been described by the use of the colour atlas compiled by Villalobos-Dominguez and Villalobos (1947).

All the drawings, which in most cases are of type specimens, were made by projecting an image of the slide onto the drawing surface : the drawings are of a ventral view unless otherwise stated. The scale placed near each drawing or group of drawings represents one millimetre : drawings of the various parts of the male genitalia of a given taxon are always to the same scale.

Material

Apart from the large collection of the genus in the British Museum (Nat. Hist.) including much material from the Rothschild collection and the collection from the Federated Malay States Museum, further important material and type specimens have been kindly lent to me by the following institutions : Deutsches Entomologisches Institut, Berlin-Friedrichshagen; Hope Department of Entomology, Oxford ; Institut Royal des Sciences Naturelles de Belgique, Bruxelles; Landbouwhogeschool te Wageningen ; Museum National d'Histoire Naturelle, Paris ; Naturhistorisches Museum, Vienna ; Naturhistoriska Riksmuseum, Stockholm ; Rijksmuseum van Natuurlijke Historie, Leiden ; Zoologisches Forshungsinstitut und Museum Alexander Koenig, Bonn ; Zoologisches Museum der Humboldt Universität, Berlin.

Type specimens are in the British Museum (Nat. Hist.) unless otherwise stated. All types have been examined except for the type of *arikana* Matsumura which is presumably in Japan, and that of *sadana* Moore which is probably lost (see Horn and Kahle (1935–1937)).

Acknowledgments

My grateful thanks are due to the following gentlemen who kindly arranged loans of material through their respective institutions: Professor Dr. H. Sachtleben, Professor G. C. Varley, Mr. E. Taylor, Dr. A. Collart, Professor W. Roepke, Dr. P. Viette, Dr. Schönmann, Dr. R. Malaise, Dr. A. Diakonoff, Dr. H. Höne and Professor Dr. E. M. Hering. I am especially grateful to Dr. H. Höne who placed at my disposal the whole of his invaluable Oriental collection.

Species removed from ***Tridrepana*** Swinhoe

Five species catalogued under *Tridrepana* Swinhoe by Gaede (1931) must be removed from the genus.

Three of these species can be placed in *Strepsigonia* Warren, resulting in the following new binomina:

Strepsigonia diluta (Warren), 1897, *Novit. zool.* **4**: 18. (COMB. NOV.)
Strepsigonia subobliqua (Warren), 1897, *Novit. zool.* **4**: 18. (COMB. NOV.)
Strepsigonia quadripunctata (Walker), 1862, *J. Linn. Soc.* (*Zool.*) **6**: 175. (COMB. NOV.)

The position of the remaining species, *Drepanodes trilinearia* Moore, 1867, *Proc. zool. Soc. Lond.* **1867**: 618 and *Tridrepana trisulcata* Warren, 1896, *Novit. zool.* **3**: 340, is doubtful: they are closely related to each other and to *Drepana pulvis* Oberthür. None of the above species can be correctly placed in *Drepana* Schrank however.

Tridrepana Swinhoe

Tridrepana Swinhoe, 1895, *Trans. R. ent. Soc. Lond.* **1895**: 3. Type by subsequent designation, *Drepana albonotata* Moore (Warren, 1922, *Gross-Schmetterl.* **10**: 464).
Tridrepana Swinhoe, Warren, 1896, *Novit. zool.* **3**: 339.
Tridrepana Swinhoe, Warren, 1903, *Novit. zool.* **10**: 346.
Tridrepana Swinhoe, Swinhoe, 1905, *Ann. Mag. nat. Hist.* (7) **16**: 620.
Tridrepana Swinhoe, Gaede, 1931, *Lepid. Cat.* **49**: 28.
Tridrepana Swinhoe, Gaede, 1933, *Bull. Mus. Hist. nat. Belg.* **9**, No. 43: 1.
Tridrepana Swinhoe, Bryk, 1943, *Ark. Zool.* **34**A, No. 13: 15.
Iridrepana (sic) Swinhoe, Warren, 1922, *Gross-Schmetterl.* **10**: 464.
Iridrepana (sic) Swinhoe, van Eecke, 1929, *Zoöl. Meded.* **12**: 77.
Konjikia Nagano, 1917, *Bull. Nawa ent. Lab.* **2**: 39. Type by original designation and monotypy, *Drepana crocea* Leech.
Konjikia Nagano, Matsumura, 1921, *Thous. Ins. Japan Addit.* **4**: 949.
Drepana Schrank, Moore, 1865, *Proc. zool. Soc. Lond.* **1865**: 816.
Drepana Schrank, Snellen, 1876, *Tijdschr. Ent.* **20**: 19.
Drepana Schrank, Moore, 1879, *Descr. Lep. Atk.* p. 83.
Drepana Schrank, Cotes and Swinhoe, 1887, *Cat. Moths India* p. 184.
Drepana Schrank, Leech, 1888, *Proc. zool. Soc. Lond.* **1888**: 648.
Drepana Schrank, Hampson, 1892, *Fauna Brit. India Moths* **1**: 333.
Drepana Schrank, Warren, 1896, *Novit. zool.* **3**: 272.
Drepana Schrank, Hampson, 1897, *J. Bombay nat. Hist. Soc.* (2) **11**: 287.
Drepana Schrank, Leech, 1898, *Trans. R. ent. Soc.* **1898**: 365.
Drepana Schrank, Dudgeon, 1899, *J. Bombay nat. Hist. Soc.* (4) **12**: 651.
Drepana Schrank, Hampson, 1910, *J. Bombay nat. Hist. Soc.* (1) **20**: 98.
Drepana Schrank, Strand, 1911, *Gross-Schmetterl.* **2**: 201.
Drepana Schrank, Gaede, 1931, *Lepid Cat.* **49**: 17.

Callidrepana Felder, Butler, 1886, *Ill. Lep. Brit. Mus.* **6** : 17.
Callidrepana Felder, Butler, 1887, *Ann. Mag. nat. Hist.* (5) **19** : 224.
Callidrepana Felder, Cotes and Swinhoe, 1887, *Cat. Moths India*, p. 186.
Callidrepana Felder, Kirby, 1892, *Syn. Cat. Lep. Het.* p. 730.
Callidrepana Felder, Swinhoe, 1895, *Trans. R. ent. Soc. Lond.* **1895** : 3.
Platypteryx Laspeyres, Kirby, 1892, *Syn. Cat. Lep. Het.* p. 730.
Albara Walker, Kirby, 1892, *Syn. Cat. Lep. Het.* p. 734.

Type species *Drepana albonotata* Moore

DESCRIPTION : MALE. Palp slender, upcurved to just above labrum, yellow. Antenna strongly bipectinate and plumose from base to near apex, longest antennal pectination longer than greatest diameter of eye except in *rectifascia* ; yellow, often irrorated proximally with brown. Head reddish brown immediately anterior to antennae, rest of head yellow or orange.

Thorax usually with narrow whitish anterior border (scales of anterior part of patagia) ; rest of thorax and abdomen as for ground colour of corresponding surfaces of wings except in *subtusmaculata*. Patagia small. Tegulae well developed, extending posteriorly nearly to apex of V-shaped suture of mesothorax. Fore wing weakly to strongly falcate apically, outer margin straight or slightly convex. R_1 arising from between one-half and two-thirds length of areole (free, from cell in *flava*) ; R_2 from near end or areole ; R_4 anastomosing with R_3, and sometimes with base of R_2, to near apex of wing, forming areole ; R_4 stalked with R_5 ; R_5 usually stalked with M_1 ; remaining veins as in Text-fig. 1. Ground colour of upperside of fore wing usually yellow but brown in *mediata*, *olivacea* and *cervina* ; frequently lustrous. Proximal part of costa usually darker than rest of wing. Wing markings (except for *melliflua*) usually reddish-brown except for medial spots and distal edge of anterior part of subterminal ; antemedial always present ; combination of two or more medial spots usually present, usually whitish edged with brown (Text-fig. 1) ; additional spots sometimes present at end of cell posterior to latter spots, especially in species group *sadana* ; brown medial shade present in most species groups ; postmedial simple or double, usually lunulate ; subterminal usually well marked and darker than other wing markings, individual markings greatly enlarged in anterior part of wing and edged distally with whitish scales ; marginal shade usually present between anterior part of subterminal and outer margin ; fringe of outer margin similar in colour to adjacent region of wing (entirely dark in *marginata*). Ground colour of upperside of hind wing similar to fore wing. Colour and pattern of markings similar to fore wing but usually with only posterodistal and discocellular spot present, subterminal markings (sometimes absent) not enlarged anteriorly, and medial shade usually absent. Hind wing with $Sc+R_1$ approximating to Rs for short distance distal to end of cell in most species of species group *fulvata* but anastomosing for short distance with Rs in remaining species groups and in most specimens of *melliflua* and *acuta*. Underside of fore wing always yellow, usually slightly lustrous ; medial spots and anterior part of postmedial usually moderately well marked ; fringe of outer margin as for upperside. Patch of dark brown, thickened scales (possibly sensory) at base of cell in species group

crocea, and in *microcrocea* and *rectifascia*. Frenulum usually not or only slightly clavate apically; strongly clavate in *marginata* and *rectifascia*. Ground colour of hind wing as for fore wing; without markings in species groups *fulvata, albonotata, crocea, olivacea* and *postica*; discocellular and posterodistal spot usually well marked in species group *sadana*; discocellular and posterodistal spot and anterior part of distal postmedial line strongly marked in *flava*.

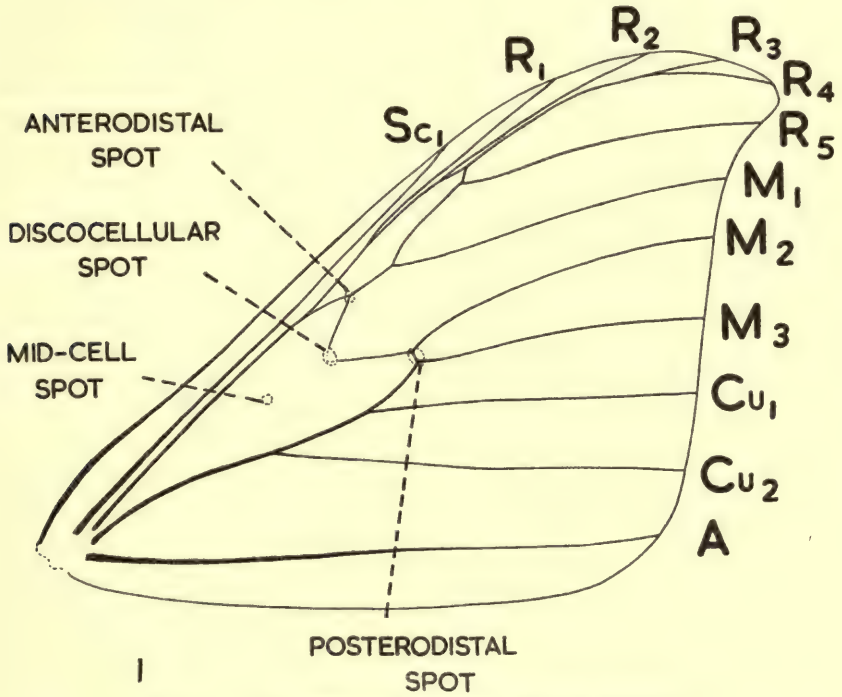


FIG. 1. Fore wing of *Tridrepana fulvata* (Snellen).

FEMALE. As for male but with following differences. Larger. Longest antennal pectination usually shorter than greatest diameter of eye, sometimes just longer than diameter of antennal shaft at that point. Outer margin of fore wing usually slightly or moderately convex.

GENITALIA : MALE. Saccus usually well developed, small in species group *sadana*. Valve small and rounded in species group *sadana* with longitudinal sulcus along middle of outer surface and corresponding ridge on inner surface; valves usually widely separated medially. Valve moderately small in *postica* and *argentistriga*; usually large in remaining species, with inner surface variously lobed and spined and usually densely hairy, outer surface slightly hairy, and dorsal margin slightly dilated basad; valves usually contiguous medially. Anellus poorly developed in species groups *postica, sadana* and *flava*; moderately well developed in species group *crocea*; usually strongly developed dorsal and lateral to base of aedeagus in remaining species groups, variously shaped and ornamented. Gnathus usually

well developed; medial pad usually present, spinose or tuberculate and produced posteriorly as free sub-anal flap in species groups *albonotata*, *olivacea* and most of *crocea*; sometimes with variously shaped lobes and processes medially; lateral arm on either side of medial structures usually well developed. Tegumen well developed. Socius hairy, usually small and rounded; long in *rectifascia* and species groups *crocea* and *flava*. Uncus bifurcate posteromedially, usually hairy, variously shaped. Aedeagus usually with inner and outer cornutus (Text-fig. 11) and spinose vesica; species groups *postica* (except for *rectifascia*) and *sadana* without cornuti; inner cornutus alone present in *flava*. Eighth sternite forming part of genitalic apparatus, usually strongly developed and often bilobed posteriorly, apodemes long; less strongly developed in species group *sadana* (except for *marginata*), with short apodemes. Eighth tergite forming dorsal shield over rest of genitalic structures, usually sub-quadrate, slightly tapered posteriorly; apodemes moderately well developed in most species groups but small in species group *sadana* (except for *marginata*).

FEMALE. Preostial sternite usually hairy or minutely spinose; concave plate or plates present in species group *albonotata*; submembranous lobe on either side in species group *olivacea*. Bursa copulatrix with pair of signa or without signa. Ductus bursae long and sculptured in most species groups, shorter and unsculptured in species groups *postica* and *sadana*; ostium with operculum in few species. Spermatheca nearly spherical; unornamented and with short spermathecal duct in species groups *postica* and *sadana* and most of *albonotata*; radially ornamented and with long duct in remaining species. Ostial segment usually well developed, sometimes produced posterodorsally over ovipositor lobes: submembranous lobe present on either side in species group *olivacea*. Two pairs of ovipositor lobes usually present: papillate and hairy ventral pair, not united with each other medially; dorsal pair usually partially fused with each other medially, sometimes forming hood over ventral lobes, less distinctly papillate and hairy. Additional one or more pairs of lobes associated with above lobes in some species.

DISTRIBUTION. Species group *fulvata* occurs in the whole of the Oriental region and in the Austro-Malayan subregion: the Phillippines, Celebes and Buru all possess a single peculiar species and two species are peculiar to New Guinea; one species occurs in both the Indian and Indo-Malayan subregions, and one in both the Indian and Indo-Chinese subregions. The range of species group *albonotata* is similar to that of *fulvata*; *obscura* is apparantly peculiar to Bali and Java, and *aequinota* to Buru. In the species group *crocea*, one species occurs in both the Indo-Chinese subregion and in Japan (Manchurian subregion) and one in both the Indian and Indo-Malayan subregions. All the species of species group *olivacea* are confined to New Guinea and associated islands. Species group *postica* occurs in the Indian and Indo-Malayan subregions and in Celebes; *rectifascia* is peculiar to the Philippines. The nine species of species group *sadana* are found only in the Indian and Indo-Chinese subregions. *T. flava* occurs in the Indian and Indo-Malayan subregions and in Celebes.

The wide distribution of the polytypic *albonotata* is worthy of note, the species

occurring in each subregion of the Oriental region, and in Celebes. Together with *aequinota* and *mediata* the species forms a single extensive superspecies.

The forms from Celebes and Buru, which in every case are peculiar species or subspecies (Celebes has one peculiar species and three peculiar subspecies, and Buru two peculiar species), are more closely related to the Oriental than to the Australasian fauna, no New Guinea species being found in either island. Further material from the Lesser Sundas and the Moluccas would be interesting in determining the zoogeographical boundary between the above faunas.

Only one species, *crocea*, extends into the Palaearctic, the species occurring in Japan as well as in certain south-eastern provinces of China.

The paucity of the material from South Burma, Indochina, Siam and North Malaya does not allow conclusions to be made regarding the boundaries separating the Indian, Indo-Chinese and Indo-Malayan elements of the genus ; nor is it possible to comment upon the apparent distinctness of the Ceylonese representatives until further material is available.

Discussion. Throughout most of the genus the male genitalia provides the most useful and constant diagnostic characters. In the species group *sadana*, however, the genitalic differences between males of related species are much smaller and less important diagnostically than the colour pattern of the wings, which without exception provides adequate and reliable characters. A classification based only on male genitalia characters would undoubtedly require the above species group to be separated from the remaining groups ; separation, however, would serve no useful purpose and its affinities with the rest of the genus, based on external characters, are obvious.

Both sexes of *fulvata* and *lunulata* occur in one of two colour forms : one with the ground colour of the upperside of the fore wing entirely yellow, and the other with a reddish-brown medial shade on the fore wing. The latter form is apparently less common than the former. In *olivacea* (male) there are again two distinct colour forms, one similar to the shaded or banded form of the species mentioned above, and the other with the upperside of both wings brown : in this case, the brown specimens outnumbered the yellow in the material examined. The only specimen of *cervina* available for study belonged to the brown form of the species.

Key to Species Groups

1.		Hind tibia with one pair of spurs	2
		Hind tibia with two pairs of spurs . . . . . (*flava*)	47
2	(1)	Upperside of fore wing with mid-cell spot	3
		Upperside of fore wing without mid-cell spot	6
3	(2).	Upperside of fore wing with anterodistal spot . . . . (*fulvata* gr.)	7
		Upperside of fore wing without anterodistal spot	4
4	(3).	Postmedial of upperside of hind wing double, at least near inner margin; postmedial of underside of fore wing corresponding to distal postmedial of upperside	5
		Postmedial of upperside of hind wing simple; postmedial of underside of fore wing simple, corresponding to postmedial of upperside . . (*olivacea* gr.)	32

5 (4). Upperside of fore wing with medial shade, underside of male with dark patch of scales at base of cell . . . . . (*crocea* gr.) 28
Fore wing without such medial shade or dark patch . . . (*sadana* gr.) 38
6 (2). Postmedial of upperside of hind wing double, lunulate . . (*albonotata* gr.) 18
Postmedial of upperside of hind wing simple, non-lunulate . . (*postica* gr.) 35

N.B. The remainder of the key is based on male characters only, except in species groups *postica* and *sadana* where the key applies to both sexes.

Species Group *fulvata*

7 (3). Upperside of fore wing with white mid-cell spot (Pl. 1, fig. 4) . . . *trialba*
Upperside of fore wing with brown mid-cell spot 8
8 (7). Upperside of both wings without dark brown markings . . . . *melliflua*
Upperside of both wings with dark brown markings 9
9 (8). Male genitalia as in Text-fig. 32 . . . . . (*arikana*) 10
Male genitalia not as above 11
10 (9). Outer lateral surface of each posterior process of uncus with strongly toothed carina . . . . . *arikana falcipennis*
Uncus only weakly carinate laterally, with single small tooth . . *arikana arikana*
11 (9). Posterior process of anellus concave ventrally (Text-figs. 2, 6) . . (*fulvata*) 12
Posterior process of anellus convex ventrally 13
12 (11). Male genitalia as in Text-fig. 2 . . . . . *fulvata fulvata*
Male genitalia as in Text-fig. 6 . . . . . *fulvata brevis*
13 (11). Uncus with long apically bifurcate ventral arms, and rounded dorsal lobes (Text-figs. 10, 14) . . . . . (*lunulata*) 14
Uncus not as above 16
14 (13). Male genitalia as in Text-fig. 10 . . . . . *lunulata fasciata*
Male genitalia not as above 15
15 (14). Male genitalia as in Text-fig. 14 . . . . . *lunulata prolata*
Male genitalia not as above (anellus probably bifurcate) . . *lunulata lunulata*
16 (13). Gnathus with strongly sclerotized posterior flange; uncus bisigmoid in shape (Text-fig. 19) . . . . . *sigma*
Male genitalia not as above 17
17 (16). Posterior process of anellus sharply pointed (Text-fig. 20) . . . . *acuta*
Posterior process of anellus spatulate (Text-fig. 28) . . . . *spatulata*

Species Group *albonotata*

18 (6). Underside of fore wing with patch of dark scales at base of cell . *microcrocea*
Underside of fore wing without such patch 19
19 (18). Upperside of both wings brown . . . . . *mediata*
Ground colour of upperside of wings yellow 20
20 (19). Medial shade present on upperside of both wings 21
Medial shade only present on fore wing 22
21 (20). Eighth sternite deeply emarginate posteriorly (Text-fig. 50) . . *albonotata ferrea*
Eighth sternite not emarginate (Text-fig. 51) . . . *albonotata pervasata*
22 (20). Upperside of fore wing with anterior markings of subterminal only slightly larger than posterior markings (Pl. 1, fig. 8) . . . . . *aequinota*
Anterior markings of subterminal much larger than anterior markings . . 23
23 (22). Upperside of fore wing with proximal postmedial line nearly straight posterior to M_3 (Pl. 1, fig. 11) . . . . . *sera*
Upperside of fore wing with proximal postmedial line lunulate posterior to M_3, inflexed immediately posterior to Cu_2 24
24 (23). Male genitalia as in Text-fig. 61 . . . . . *obscura*
Male genitalia not as above 25

25 (24). Eighth sternite as in Text-fig. 39 26
Eighth sternite not as above 27
26 (25). Male genitalia as in Text-fig. 38 . . . . . *albonotata angusta*
Male genitalia as in Text-fig. 41 . . . . . *albonotata rotunda*
27 (25). Posterior margin of eighth sternite deeply emarginate (Text-fig. 36) *albonotata albonotata*
Posterior margin of eighth sternite not deeply emarginate (Text-fig. 44) ***albonotata celebesensis***

SPECIES GROUP *crocea*

28 (5). Upperside of hind wing with strongly marked medial shade (Pl. 1, fig. 15) *subtusmaculata*
Upperside of hind wing without medial shade 29
29 (28). Gnathus with three sclerotized processes posteriorly (Text-figs. 77, 81) . . 30
Gnathus without posterior processes . . . . . (*septempunctata*) 31
30 (29). Anterior process of gnathus broad, terminating in two prongs . . *crocea*
Anterior process of gnathus narrow, pointed . . . . . *unispina*
31 (29). Socius with short inwardly directed process at base *septempunctata septempunctata*
Socius without such process . . . . . *septempunctata nitidior*

SPECIES GROUP *olivacea*

32 (4). Upperside of fore wing with narrow medial shade (pl. 49*c*, Gross-Schmetterl. 10.) . . . . . *obliquitaenia*
Upperside of fore wing with broad medial shade (Pl. 1, figs. 13, 14) . . 33
33 (32). Male genitalia as in Text-figs. 93–95 . . . . . *examplata*
Male genitalia not as above . . . . . (*olivacea*) 34
34 (33). Male genitalia as in Text-figs. 96–98 . . . . . *olivacea olivacea*
Male genitalia as in Text-figs. 99–101 . . . . . *olivacea crocata*

SPECIES GROUP *postica*

35 (6). Subterminal fascia present on upperside of hind wing 36
Subterminal fascia absent on upperside of hind wing . . (*argentistriga*) 37
36 (35). Upperside of fore wing with anterior subterminal markings greatly enlarged (Pl. 2, fig. 4); underside with patch of dark thickened scales at base of cell *rectifascia*
Upperside of fore wing with anterior markings of subterminal equal in size to posterior markings (Pl. 2, fig. 1); underside without dark patch at base of cell . . . . . *postica*
37 (35). Upperside of fore wing with whole of subterminal well marked (Pl. 2, fig. 2); upperside of hind wing without non-lustrous band between postmedial and outer margin . . . . . *argentistriga argentistriga*
Upperside of fore wing with posterior subterminal markings absent (Pl. 2, fig. 3); upperside of hind wing with non-lustrous band between postmedial and outer margin . . . . . *argentistriga brevilinea*

SPECIES GROUP *sadana*

38 (5). Upperside of fore wing and posterior half of hind wing irrorated with dark brown scales . . . . . *thermopasta*
Upperside of wings not irrorated as above 39
39 (38). Hind wing with posterior part of outer marginal fringe darker than rest of fringe (Pl. 2, fig. 11) . . . . . *marginata*
Hind wing with outer marginal fringe unicolorous 40

40 (39). Upperside of hind wing with distal postmedial line only developed posterior to Cu_2 41
Upperside of hind wing with distal postmedial line well developed anterior to and posterior to Cu_2 44
41 (40). Upperside of fore wing with faintly marked lunulate subterminal edged distally with lustrous whitish line 42
Upperside of fore wing with subterminal not as above, only developed anterior to M_3 43
42 (41). Colour pattern of upperside strongly marked (Pl. 2, fig. 8); with dark brown markings . . . . . *sadana*
Colour pattern of upperside weakly marked; without dark brown markings *aurorina*
43 (41). Fore wing strongly falcate apically (Pl. 2, fig. 6) . . . . . *adelpha*
Fore wing moderately falcate apically (Pl. 2, fig. 7) . . . . . *finita*
44 (40). Upperside of hind wing with subterminal . . . . . *maculosa*
Upperside of hind wing without subterminal 45
45 (44). Ground colour of upperside of hind wing and proximal part of fore wing, light yellow . . . . . (*rubromarginata*) 46
Ground colour of upperside of both wings dull brownish orange (Pl. 2, fig. 12) . *fulva*
46 (45). Upperside of fore wing with diffuse dark brown patch between Cu_1 and Cu_2 proximal to antemedial (Pl. 2, fig. 5) . . . . *rubromarginata indica*
Upperside of fore wing without such patch . . *rubromarginata rubromarginata*

SPECIES GROUP *flava*

47 (1). Male genitalia as in Text-figs. 145, 146, 151 . . . . . *flava flava*
Male genitalia not as above 48
48 (47). Male genitalia as in Text-figs. 148, 152 . . . . . *flava contracta*
Male genitalia as in Text-figs. 150, 153. . . . . *flava unita*

Species group *fulvata* Snellen

Except for *arikana* Matsumura, this group forms a remarkably homogeneous unit. Each species possesses four medial spots and a simple postmedial on the upperside of both wings. The anellus in the male genitalia is produced posteriorly as a long, free process, except in *arikana* Matsumura where this process is closely apposed to the medial part of the gnathus. In the female the spermatheca is radially ornamented, the signa slightly concave and the dorsal ovipositor lobes small.

fulvata Snellen, *lunulata* Butler and *arikana* Matsumura are polytypic.

fulvata Snellen and *lunulata* Butler exhibit polymorphism.

Tridrepana fulvata fulvata (Snellen)

Drepana fulvata Snellen, 1876, *Tijdschr. Ent.* **20** : 19.
Platypteryx fulvata (Snellen), Kirby, 1892, *Syn. Cat. Lepid. Het.* p. 731.
Tridrepana fulvata (Snellen), Warren, 1903, *Novit. zool.* **10** : 346.
Iridrepana fulvata (Snellen), van Eecke, 1929, *Zoöl. Meded.* **12** : 77.
Tridrepana fulvata (Snellen), Gaede, 1931, *Lepid. Cat.* **49** : 29.
Iridrepana albonotata (Moore), Warren, 1922, *Gross-Schmetterl.* **10** : 464.
Callidrepana lunulata Butler, van Eecke, 1929, *Zoöl. Meded.* **12** : 77.
Callidrepana lunulata Butler, Gaede, 1931, *Lepid. Cat.* **49** : 29.

TYPE. Type not designated by Snellen. Species described from Java material,

DESCRIPTION : MALE. 37·2, 30·0–38·0 mm. (25). Outer surface of palp, and head between and posterior to antennae, OOY–15–11° ; head anterior to antennae, OOS–5–12°, to OY–19–5° above labrum ; antenna OOY–17/18–12°, proximal inner pectinations sometimes irrorated with OOS–5–12°, longest pectination about one and a quarter times greatest diameter of eye.

Thorax with narrow whitish anterior border ; rest of thorax and abdomen OOY–17/18–12° above, OY–19–5° below. Fore wing moderately falcate apically ; outer margin straight except at apex. R_1 usually from between one-third and one-half areole ; R_2 from near end of areole, usually from just distal to end ; M_1 usually stalked with R_5. Ground colour of upperside of fore and hind wing as for thorax. Fore wing with proximal half of costa irrorated with OOY–6–8° ; antemedial from one-sixth costa, bent inwards at posterior margin of cell to just over one-quarter inner margin of wing ; mid-cell spot and anterodistal spot, both O–4–10° ; whitish discocellular spot sometimes edged with OOY–17–12° ; white posterodistal spot edged with O–4–10° ; large ovate spot posterior to latter spot and contiguous with it, O–10–12°, usually faintly edged with O–4–10°, variable in size but usually extending posteriorly to midway between Cu_1 and Cu_2 ; postmedial simple, from three-quarters costa, sinuous at first then arched round end of cell to just over half inner margin of wing ; subterminal expanded into dark spots anterior to M_3 (largest between M_1 and M_2) each edged distally with whitish patch ; subterminal continued posteriorly as short narrow dash between M_3 and Cu_1, and Cu_1 and Cu_2, with two similar dashes between Cu_2 and 2A ; marginal shade between anterior part of subterminal and outer margin from apex to Cu_1, O–10–5° ; fringe bordering marginal shade O–5–10°. All fasciae O–4–10°. Wing irrorated with lustrous scales anterior to cell, from base to two-thirds ; all spots and fasciae lustrous, except for ovate spot immediately posterior to posterodistal spot, and dark part of subterminal markings between M_1 and M_3. Hind wing with Sc + R_1 usually approximating to Rs distal to end of cell, sometimes touching at a point. Antemedial from one-quarter costa to one-third inner margin, indistinctly marked ; whitish discocellular spot ; posterodistal spot similarly coloured but edged with dark scales as in fore wing ; postmedial simple, from two-thirds costa to about two-thirds inner margin, interrupted at veins anterior to Cu_2, lunulate between M_2 and Cu_2 ; subterminal of short interneural dashes. Colour of fasciae as for fore wing. Spots and fasciae lustrous, rest of wing non-lustrous. Underside of fore and hind wing OY–19–12°, slightly paler towards inner margin of fore wing. Fore wing with trace of discocellular spot and posterodistal spot ; anterodistal spot strongly marked ; anterior part of postmedial well marked as interneural dashes, O–6–11° ; anterior part of subterminal sometimes well marked, with marginal shade distally ; colour of fringe as for upperside ; other markings may show through faintly from upperside. Hind wing unmarked beneath but with upperside markings sometimes showing through. Ground colour and all markings of underside slightly lustrous.

FEMALE. 39·1, 32·5–45·0 mm. (7). As for male but with following differences. Longest pectination of antenna equal in length to, or shorter than, greatest diameter of eye. Outer margin of fore wing slightly convex, not straight. Upper-

side of fore wing with dark spot posterior to posterodistal spot larger, usually touching Cu_2 posteriorly ; marginal shade between anterior part of subterminal and outer margin not extending posterior to M_3 ; wing lustrous posterior to cell and M_3, from base to immediately proximal to subterminal, paler and more distinctly lustrous distally. Upperside of hind wing with posterodistal spot more sharply edged with dark scales ; area of lustrous scales extending from base to postmedial.

GENITALIA : MALE (Text-figs. 2, 3). Saccus long, digitate. Valve long, tapered, arcuate. Anellus greatly developed ; rounded lobe on each side of base of aedeagus produced anterodorsally, bands fusing medially to form broad medial plate, then reflexed through nearly 360° and produced posteriorly as long, free, cymbiform process, concave ventrally. Gnathus forming subtriangular pad medially, covered with minute hair-like spines ; lateral arms well developed. Socius small. Uncus bifurcate posteriorly, with downcurved dorsal pair of arms, and apically emarginate ventral pair of arms. Aedeagus with inner and outer cornutus well developed ; vesica minutely spinose, with group of longer spines on side opposite outer cornutus. Eighth sternite emarginate posteromedially. Width at anterior margin of eighth tergite equal to least width of eighth sternite, slightly tapered to three-quarters of its length then widened again to posterior margin ; apodeme equal in length to half greatest width of tergite.

FEMALE (Text-figs. 7, 8). Posterior margin of preostial sternite with minutely spinose patch medially. Bursa copulatrix with two nearly identical, scobinate ovate signa situated at opposite sides of bursa. Ductus bursae well sclerotized posteriorly. Ventral lip of ostium forming broad, bilobed operculum. Spermatheca with radial ornamentation proximally. Ostial segment greatly enlarged dorsally, bilobed posteriorly and produced over base of ovipositor lobes. Ventral ovipositor lobes heavily sclerotized basally, papillate and hairy posteriorly. Dorsal ovipositor lobes probably represented by two small posterior lobes.

Banded form.—MALE. As for male described above but upperside of fore wing with dark medial shade (O–9–12°) between antemedial and postmedial fascia, except for small area immediately proximal to postmedial between M_3 and Cu_2, sometimes extending proximal to the antemedial ; veins between end of cell and distal margin of shade lightly irrorated with lustrous scales ; costa bordering shade O–6–7°.

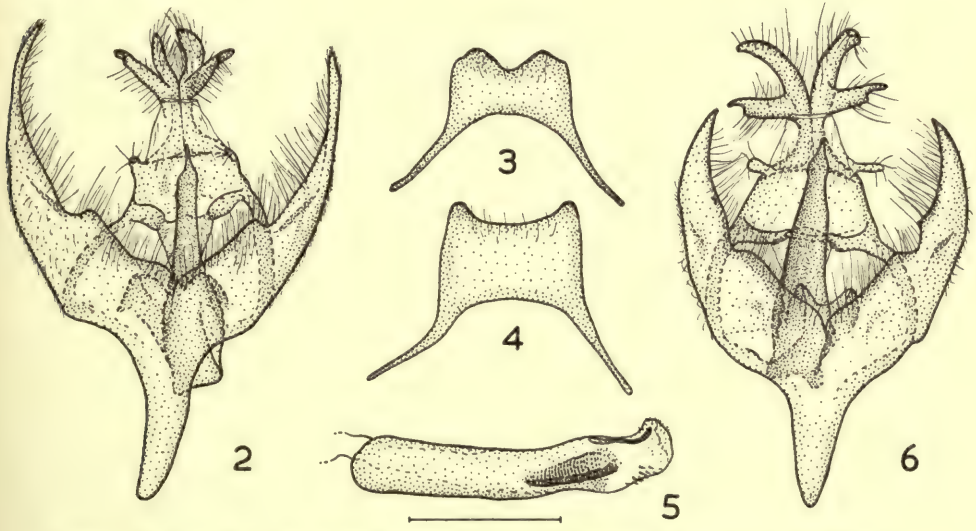
FEMALE. As for female described above, but upperside of fore wing with whole of area between antemedial and postmedial fascia shaded with O–9–12° ; hind wing lightly irrorated with same colour from near base to postmedial, most strongly marked distally.

DIAGNOSIS. Differs from *lunulata* Butler and the remaining species of the species group in the shape of the uncus and the ventrally concave posterior process of the anellus in the male (Text-fig. 2, 3) : in the female the ostial segment is bilobed dorsally and produced over the base of the ovipositor lobes (Text-fig. 7, 8).

DISCUSSION. In the material examined, two males and one female from Java were of the banded form ; this dimorphism is closely paralleled in *lunulata* Butler.

DISTRIBUTION (Text-fig. 154). The race is distributed throughout Malaya, Sumatra, Java, Bali and Borneo. Two females from Celebes may belong to this race.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂, N. Borneo, Mt. Mulu, 1–4,000 ft. Aug., Dec., '94, Hose coll.; 2 ♀, Sarawak, Bidi, 1907–1908, C. J. Brooks; 3 ♂, S. E. Borneo, Samarinda, x. 1938, M. E. Walsh; 1 ♂, E. Bali, Git-Git, 5,000 ft., May 1936, J. P. A. Kalis; 2 ♂, 1 ♀, Bali, Low Country, W. Doherty; 4 ♂, E. Java, Nongkodjadjar, 4,000 ft., April, 1934; 2 ♂, E. Java, Tennger, Singalangoe, 5,000 ft., June, July, 1934, J. P. A. Kalis; 1 ♂, Java, Mt. Gedeh, 4,000 ft., 25.x.–2.xi.24, G. Overdijkink; 2 ♂, Java, Mt. Gedeh, Aug., Sept., Oct., 1926; 1 ♀, W. Java, Malabar, Bandoeng; 1 ♂, Java, Soekaboemi, Dec., 1924, G. Overdijkink; 2 ♂, W. Sumatra, Lebong Tandai, 6–15.ix.1921, 20–23.i.1922; 1 ♀, Sumatra; 1 ♂, 3 ♀, Singapore, H. N. Ridley, 1901, 1904, 1905, 1906; 1 ♂, Singapore, Fraser Hill, 12.vi.1930, Ridley; 1 ♂, Fraser Hill, 11.i.1929, 4,250 ft., A. S. Corbet; 2 ♂, 1 ♀, Penang, xi.96, xii.96 i–iv.98, Curtis; 1 ♂, Penang, xii.15–ii.16, C. L. Collenette; 4 ♀, Kuala Lumpur, 23.i, 16.vii, 2.xi, 16.xii.1930, A. S. Corbet; 6 ♂, Malaya, Kuala Lumpur, Jan. 17, Feb. 25, June 23, 12.viii.1931; 2 ♂, Malay Penin., Selangor, Bukit Kutu, 3,300 ft., Sept. 21, 1930, 19.iii.1931, H. M. Pendlebury; 1 ♀, Perak; 2 ♂, Kedah Peak, 3,200 ft., Dec. 1915; 1 ♀, Malay Penins., West coast, Pulau, Jarak, 5 April, 1932, E. Seimund. RIJKSMUSEUM VAN NATUURLIJKE HISTORIE, LEIDEN: 2 ♀, Java occ., Buitenzorg, 1885; 2 ♂, W. Java, Buitenzorg, 1892.



FIGS. 2. and 3. *Tridrepana fulvata fulvata* (Snellen), male. 2. Genitalia. 3. Eighth sternite.
FIGS. 4–6. *T. fulvata brevis* ssp. n., holotype male. 4. Eighth sternite. 5. Aedeagus. 6. Genitalia.

Tridrepana fulvata brevis ssp. n.

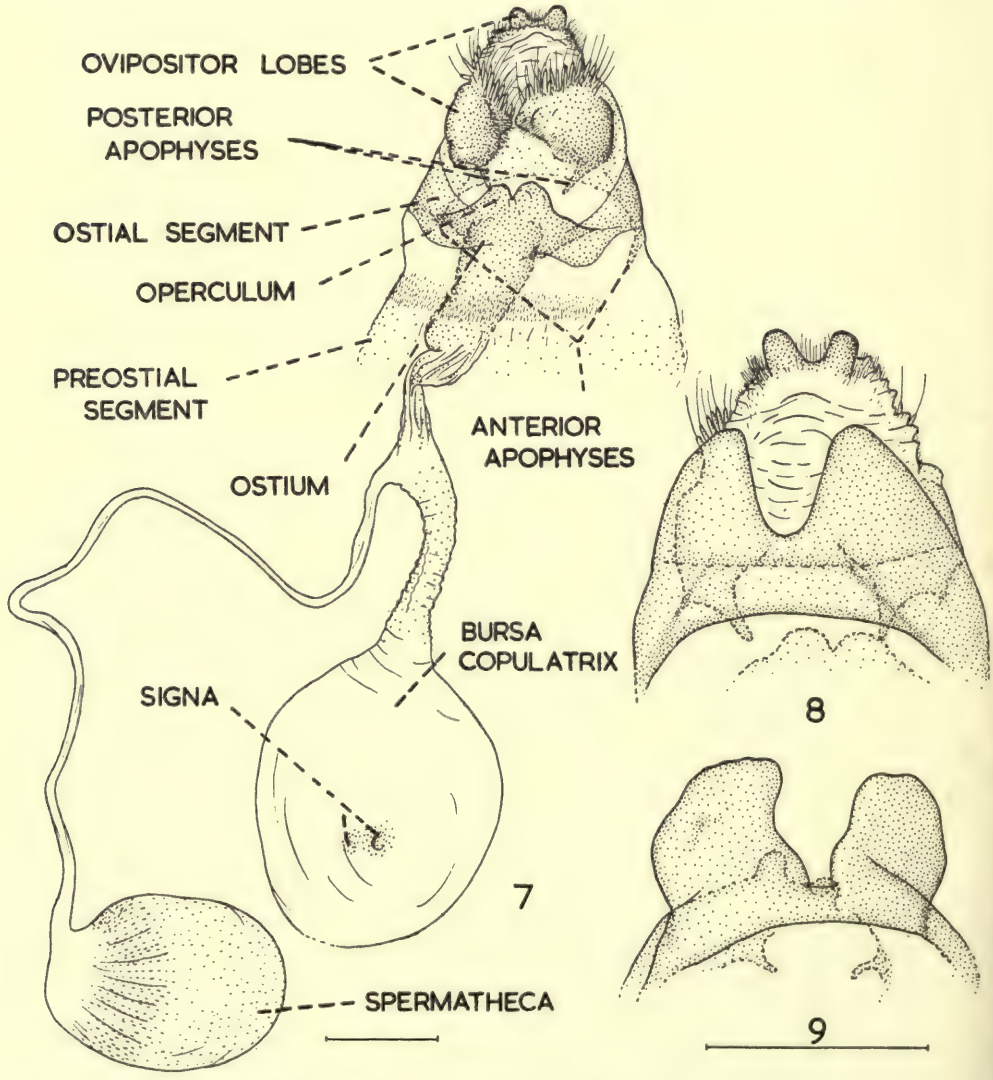
pro parte *Iridrepana albonotata* (Moore), Warren, 1922, *Gross-Schmetterl.* **10**: 464. (fig. 49*a*).

TYPE. Holotype male, Khasis, Sept. 1896; Drepanidae genitalia slide no. 155.

DESCRIPTION and DIAGNOSIS. Male, 34·5, 32·0–36·5 mm. (3). Female, 40·5, 39·0–42·0 mm. (2). No significant difference from nominate externally. Distinguished from it by the following genitalic differences.

MALE. (Text-figs. 4, 5, 6) : valve much shorter ; posterior part of anellus dentate laterally at base ; eighth sternite variable in shape but with broader posterior emargination.

FEMALE. (Text-fig. 9) : dorsal lobes of ostial segment broader posteriorly.



FIGS. 7 and 8. *Tridrepana fulvata fulvata* (Snellen), female.
7. Ventral view. 8. Dorsal view.

FIG. 9. *T. fulvata brevis* ssp. n., allotype female, dorsal view.

DISCUSSION. The race shows no dimorphism in the few specimens examined.

DISTRIBUTION. All the specimens examined were from the Khasis Hills in Assam, India. A male from Burma (in Brit. Mus.) may belong to this race. Two females from Hong Kong, one male and one female from Hainan (in Brit. Mus.), and one male from Lien Ping, China (in Zool. Mus., Berlin) may be subspecifically different.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): allotype ♀, Khasis, Sept., 1896, Drepanidae genitalia slide no. 302; 1 ♀, 2 ♂ paratypes, from type locality.

Tridrepana lunulata fasciata Warren (comb. nov.)

Tridrepana fulvata ab. *fasciata* Warren, 1903, *Novit. zool.* **10** : 346.
Iridrepana fasciata Warren, 1922, *Gross-Schmetterl.* **10** : 464. fig.
Tridrepana fulvata ab. *fasciata* Warren, Gaede, 1931, *Lepid. Cat.* **49** : 29.
Tridrepana fulvata (Snellen), Warren, 1903, *Novit. zool.* **10** : 346.
Tridrepana fulvata (Snellen), Gaede, 1931, *Lepid. Cat.* **49** : 29.

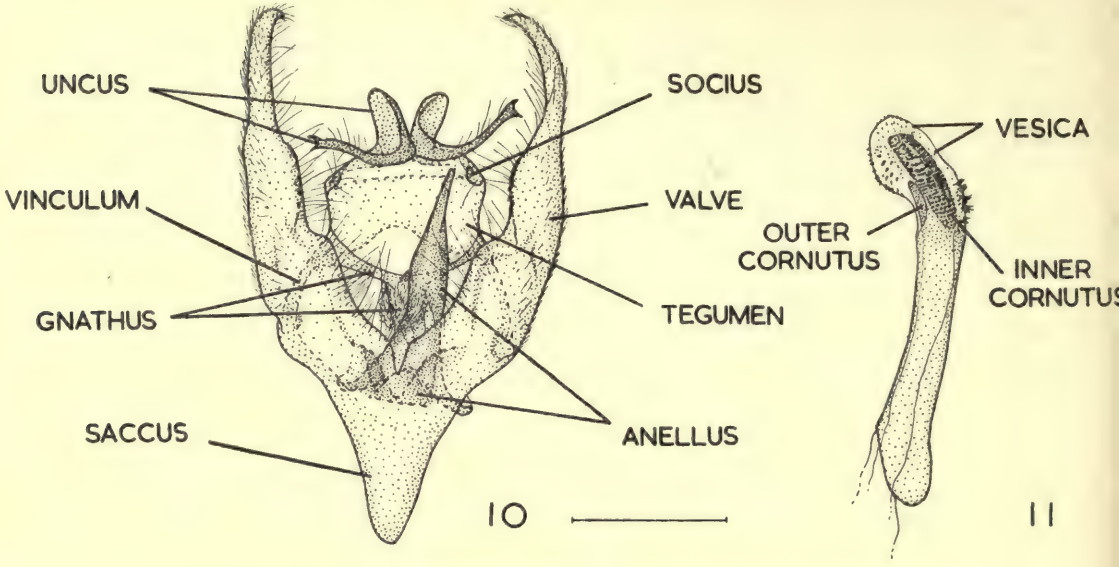
TYPE. I herewith select the following specimen as lectotype : Lectotype male, British New Guinea, Upper Aroa R., March '03, Meek ; Drepanidae genitalia slide no. 151.

DESCRIPTION : MALE. 37·2, 33·0–41·5 mm. (51). As for *fulvata* Snellen but with only light irroration of lustrous scales at base of upperside of fore wing, and underside of both wings slightly less lustrous with postmedial of fore wing less distinctly marked or absent.

FEMALE. (Pl. 2, fig. 2.). 42·0, 36·2–49·0 mm. (18). As for male, but with following differences. Longest antennal pectination equal to, or just shorter than greatest diameter of eye. Outer margin of fore wing slightly convex, not straight. Upperside of fore wing lustrous from near base to subterminal, except for cell and area anterior to M_1 and M_2 distal to cell ; dark patch posterior to postero-distal spot variable in size but usually extending posteriorly as far as Cu_2 ; anterior markings of subterminal between M_3 and R_5 with lustrous centres. Hind wing lustrous and slightly paler from base to subterminal. Underside of fore wing with anterior part of subterminal faintly marked ; only anterodistal spot may be present.

GENITALIA. MALE (Text-figs. 10, 11). Saccus moderately long, digitate, slightly tapered. Valve long, tapered, arcuate and apically falcate, with toothed carina just inside ventral margin of valve. Structure of anellus similar to *fulvata* Snellen but with posterior free process bifurcate basally and concave dorsally not ventrally. Gnathus with well developed lateral arms ; medial pad covered with fine hair-like spines, with small conical process posteriorly. Socius small. Uncus bifurcate, with pair of lateroventrally concave dorsal lobes and pair of apically bifurcate ventral arms. Aedeagus with inner and outer cornutus ; vesica minutely spinose, with group of longer spines on side opposite outer cornutus. Eighth sternite emarginate posteromedially. Eighth tergite over twice as long as its greatest transverse width, just wider anteriorly than least width of eighth sternite, slightly tapered posteriorly ; apodemes about two-thirds greatest width of tergite.

FEMALE. (Text-fig. 12). As for *fulvata* but with following differences. Each signum of bursa with distinct longitudinal sulcus. Ductus bursae bent to left



FIGS. 10 and 11. *Tridrepana lunulata fasciata* Warren, lectotype male.
10. Genitalia. 11. Aedeagus.

posteriorly. Opercular lobes of ostium evenly rounded. Posterior margin of ostial segment not bilobed dorsally, only slightly produced over base of ovipositor lobes. Dorsal ovipositor lobes shorter, sometimes hardly separated from each other medially ; with conspicuous, hairy structure anteriorly.

Banded form.—MALE. As for corresponding form of *fulvata*, but with lustrous scales evenly distributed over medial shade, not concentrated on veins.

FEMALE. As for female described above but with dark medial shade as in corresponding male form ; colour of shade paler, due to lustrous scales.

DIAGNOSIS. Male genitalia : distinguished from *fulvata* chiefly by the ventrally convex posterior process of the anellus and from both *fulvata* and the other species of the species group by the shape of the uncus. Female genitalia : separated from *fulvata* by the fact that the posterior margin of the ostial segment is not bilobed dorsally.

DISCUSSION. The race has unfortunately taken its name from the apparently least common banded form, a form which also occurs in *fulvata* as well as in *lunulata prolata*. Five males and two females of this form from various localities were found in the material examined.

DISTRIBUTION (Text-fig. 154). The race occurs in Waigeu (off N.W. coast of New Guinea) and throughout New Guinea to Goodenough Island.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : syntype ♀, Brit. New Guinea, Biagi, Mambare R., 5,000 ft., Jan. '06, A. S. Meek ; 8♂, Waigeu, Camp Nok, 2,500 ft., iv–v 1938, L. E. Cheesman ; 2 ♂, 1 ♀, Dutch New Guinea Central Arfak Mts., Ninay Valley, 3,500 ft., Nov. '08 to Jan. '09, Feb. to March '09 ; 1 ♂, 1♀,

Weyland Mts., Mt. Kunupi, Menoo Valley, 6,000 ft., Nov. 1920–Jan. 1921 ; 3 ♂, Snow Mts., nr. Oetakwa R., up to 3,000 ft., x.xii.1910, A. S. Meek ; 6 ♂, Upper Setekwa R., Snow Mts., 2–3,000 ft., Aug.–Sept., A. S. Meek ; 2 ♂, 1 ♀, from type locality ; 1 ♂, Baie de Geelwink, Ille Jobi, Ansus, 1892, W. Doherty ; 3 ♂, Cyclops Mts., Sabron, Camp 2, 2,000 ft., vii.1936, L. E. Cheesman ; 2 ♂, Humboldt Bay distr., Wembl., 8, 31.viii.1937 ; 1 ♂, Jutefa Bay, Pim., 3.vii.1937, W. Stüber ; 1 ♀, British New Guinea, Upp. Aroa R., March '03, Meek ; 1 ♂, Astrolabe Bay, C. Wahnes ; 3 ♂, 2 ♀, Kumusi R., low elevation, June, Aug., Sept. 1907, A. S. Meek ; 2 ♂, Kodoka, 1,200 ft., vii.1933, L. E. Cheesman ; 1 ♂, Ekeikei, 1,500 ft., Jan.–Feb. 1903, A. E. Pratt ; 1 ♂, Mafulu, 4,000 ft., xii.1933, L. E. Cheesman ; 1 ♂, Hydrographer Mts., 2,500 ft., Jan. 1918, Eichhorn Bros.; 1 ♂, 1 ♀, Milne Bay, xii.'98, A. S. Meek ; 6 ♂, 5♀, Goodenough I., 2,500–4,000 ft., April, May, 1913, A. S. Meek ; 1 ♂, Goodenough I., xii.'96, A. S. Meek.

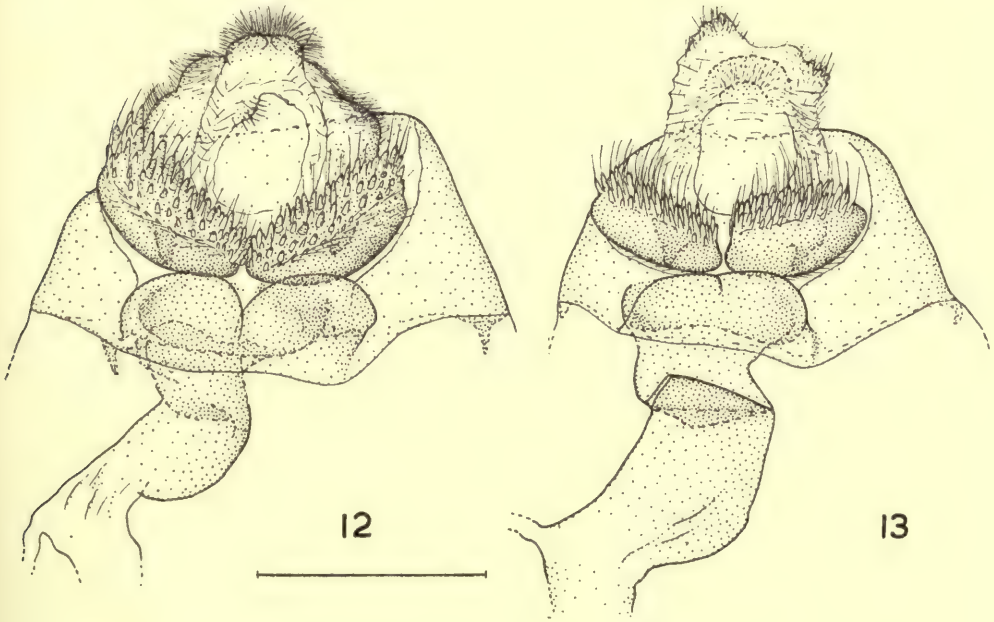


FIG. 12. *Tridrepana lunulata fasciata* Warren, female.
FIG. 13. *T. lunulata lunulata* (Butler), female.

Tridrepana lunulata prolata ssp. n.

Iridrepana fasciata Warren, 1922, *Gross-Schmetterl.* **10** : 464.
Iridrepana fulvata (Snellen), Warren, 1922, *Gross-Schmetterl.* **10** : 464.

TYPE. Holotype male, New Britain, Talesea, February 1925, A. F. Eichhorn ; Drepanidae genitalia slide no. 163.

DESCRIPTION : MALE. (Pl. 2, fig. 1). 34·4, 30·0–37·0 mm. (9). As for *fasciata*, but with following differences. Upperside of fore wing with subterminal more

strongly marked and edged with lustrous scales, markings only slightly enlarged between R_5 and M_3 ; marginal shade between anterior part of subterminal and outer margin not extending posterior to M_3 ; dark spot posterior to posterodistal spot not extending to Cu_1 : hind wing lightly irrorated with lustrous scales from base to postmedial and short distance distal to postmedial posteriorly ; subterminal as for posterior part of same fascia in fore wing.

FEMALE. 40·5, 39·0–42·0 mm. (2). As for male but with following differences. Longest antennal pectination equal to greatest diameter of eye. Outer margin of fore wing slightly convex ; upperside of base of fore wing, and area between end of cell and posterior part of postmedial, heavily irrorated with lustrous scales ; dark spot posterior to posterodistal spot lustrous, larger, sometimes touching Cu_2. Hind wing strongly and more evenly irrorated with lustrous scales from base to subterminal. All spots and fasciae in both wings edged with irroration of lustrous scales. Lustrous areas paler as in *fasciata* female. Underside with anterior part of subterminal faintly marked in fore wing, but with no trace of other markings in either wing.

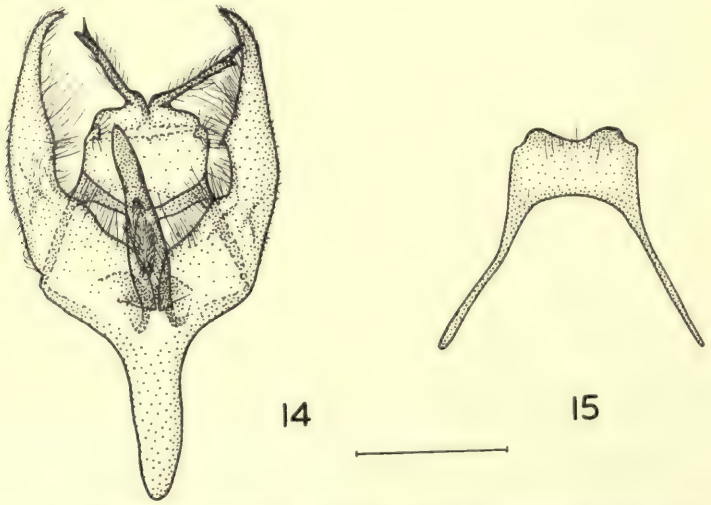
GENITALIA. As for *fasciata* but with following differences.

MALE. (Text-figs. 14, 15). Saccus slightly longer, digitate. Valves more widely separated from each other basad. Posterior, free process of anellus differently shaped. Medial part of gnathus elongate. Dorsal lobes of uncus small, inconspicuous.

FEMALE. Signa, each without longitudinal sulcus. Dorsal ovipositor lobes with weakly developed medial division posteriorly.

Banded form.—MALE. Similar to corresponding *fasciata* form.

DIAGNOSIS. Distinguished from *fulvata*, in both sexes, by the more strongly marked subterminal, the markings of which, however, are not so greatly enlarged



FIGS. 14 and 15. *Tridrepana lunulata prolata* ssp. n., holotype male.
14. Genitalia. 15. Eighth sternite.

anteriorly : lustrous scales of the ground colour surround each subterminal marking.

GENITALIA : MALE. The elongate medial part of the gnathus, and the differently shaped uncus and anellus separate the race from *fasciata*.

FEMALE. The ostial operculum is similar in shape to *fasciata* but the shape of the signa is closer to that of the nominate race.

DISCUSSION. Two males examined were of the banded form : one from New Britain and one from Rook Island.

DISTRIBUTION (Text-fig. 154). New Britain and Rook Island. One male and one female (in Brit. Mus.) from the Admiralty Islands, Manus, may belong to this race.

MATERIAL EXAMINED. (BRITISH MUSEUM (NAT. HIST.) : allotype ♀, with same data as holotype, Drepanidae genitalia slide no. 273 ; 5♂ paratypes, from type locality, January to April 1925, A. F. Eichhorn ; 1 ♀, 3 ♂ paratypes, Rook Isl., July 1913, A. S. Meek.

Tridrepana lunulata lunulata (Butler) (comb. nov.)

Callidrepana lunulata Butler, 1887, *Ann. Mag. Nat. Hist.* (5) **19** : 224.
pro parte *Callidrepana lunulata* Butler, Kirby, 1892, *Syn. Cat. Lepid. Het.* p. 730.
pro parte *Tridrepana fulvata* (Snellen), Warren, 1903, *Novit. zool.* **10** : 346.
pro parte *Iridrepana fulvata* (Snellen), Warren, 1922, *Gross-Schmetterl.* **10** : 464.
pro parte *Iridrepana fulvata* (Snellen), van Eecke, 1929, *Zoöl. Meded.* **12** : 77.
pro parte *Tridrepana fulvata* (Snellen), Gaede, 1931, *Lepid. Cat.* **49** : 29.

TYPE. Holotype female, Solomon Is., Alu (off S.E. coast of Shortland Is.).

DESCRIPTION AND DIAGNOSIS. FEMALE. 38·1, 38·0–38·2 mm. (2). Externally similar to *prolata*. (Badly worn specimens.)

GENITALIA (Text-fig. 13). As for *prolata* but with smaller ostial operculum.

MALE. Not known.

DISTRIBUTION (Text-fig. 154). Apart from the material mentioned below, sixteen specimens from Feni Is., Nissan Is., New Ireland, New Hanover and St. Matthias Is. (in Brit. Mus.) may also belong to this race. The genitalia of the males of the latter specimens is quite distinct from *prolata* in that the posterior process of the anellus is bifurcate.

MATERIAL EXAMINED. BRITISH MUSEUM (Nat. Hist.) : 1 ♀, Solomon Is., Bougaineville, May 1904, A. S. Meek.

Tridrepana melliflua Warren

Iridrepana melliflua Warren, 1922, *Gross-Schmetterl.* **10** : 466 (as new name for *crocea* Leech, Hampson). (fig.)
Tridrepana melliflua Warren, Gaede, 1931, *Lepid. Cat.* **49** : 29.

TYPE. No type selected by Warren (see discussion below).

DESCRIPTION : MALE. 33·0, 31·8–35·4 mm. (12). Outer surface of palp, and head between and posterior to antennae OOY–15–12° ; head anterior to antennae OOS–6–10°, to OY–19–12° above labrum ; antennae as for *fulvata*.

Thorax with narrow whitish anterior border; rest of thorax and abdomen OY–18/19–12° above, OY–19–5° beneath. Shape of both wings as for *fulvata*. Venation similar to *fulvata*, but with R_1 usually arising from half areole in fore wing, and Sc + R_1 usually anastomosing with Rs in hind wing. Ground colour of upperside of both wings OY–18/19–12°; no dark markings on either wing, spots and fasciae indicated by lustrous scales. Fore wing with costa darker than rest of wing, especially at base; antemedial from one-quarter costa to two-fifths inner margin; small mid-cell spot, discocellular spot and posterodistal spot; sometimes with minute anterodistal spot; postmedial from just over two-thirds costa to just over one-half inner margin, lunulate between Cu_1 and Cu_2; subterminal of single interneural dashes. Hind wing similarly marked but without mid-cell spot; postmedial not distinctly lunulate between M_2 and Cu_2; posterior half of wing, from base to postmedial, lightly irrorated with lustrous scales. Underside of both wings OY–19–12°, slightly paler posteriorly in fore wing, and distally in both wings; without markings.

FEMALE. 39·2, 35·2–43·8 mm. (4). As for male but with following differences. Longest antennal pectination equal in length to or just less than greatest diameter of eye. Upperside paler, OY–19–11°. Posterodistal cell spot extending posteriorly to Cu_1.

GENITALIA: MALE. (Text-figs. 17, 18). Saccus long, tapered. Valve long, arcuate, apically digitate; strongly toothed sigmoid carina on ventral surface. Anellus similar to *lunulata fasciata* but with free posterior process acuminate, basal prongs long and strongly divergent. Medial part of gnathus ovate and minutely spinose anteriorly, heavily sclerotized and two-pronged posteriorly; lateral arms well developed. Socius small. Uncus with two pairs of arms: apically bifurcate dorsal pair, and smaller, bifurcate ventral pair. Inner cornutus about two-fifths length of aedeagus; outer cornutus half length of inner; vesica minutely spinose. Eighth sternite well sclerotized (see figure). Eighth tergite twice as long as its greatest width, slightly tapered posteriorly; greatest width equal to least width of eighth sternite; length of apodemes three-quarters greatest width of tergite.

FEMALE. (Text-fig. 16.) As for *lunulata fasciata* but with following differences: ostium without operculum; ostial segment reduced ventrally, but produced dorsally over base of ovipositor lobes; both pairs of ovipositor lobes differently shaped; ductus bursae differently shaped.

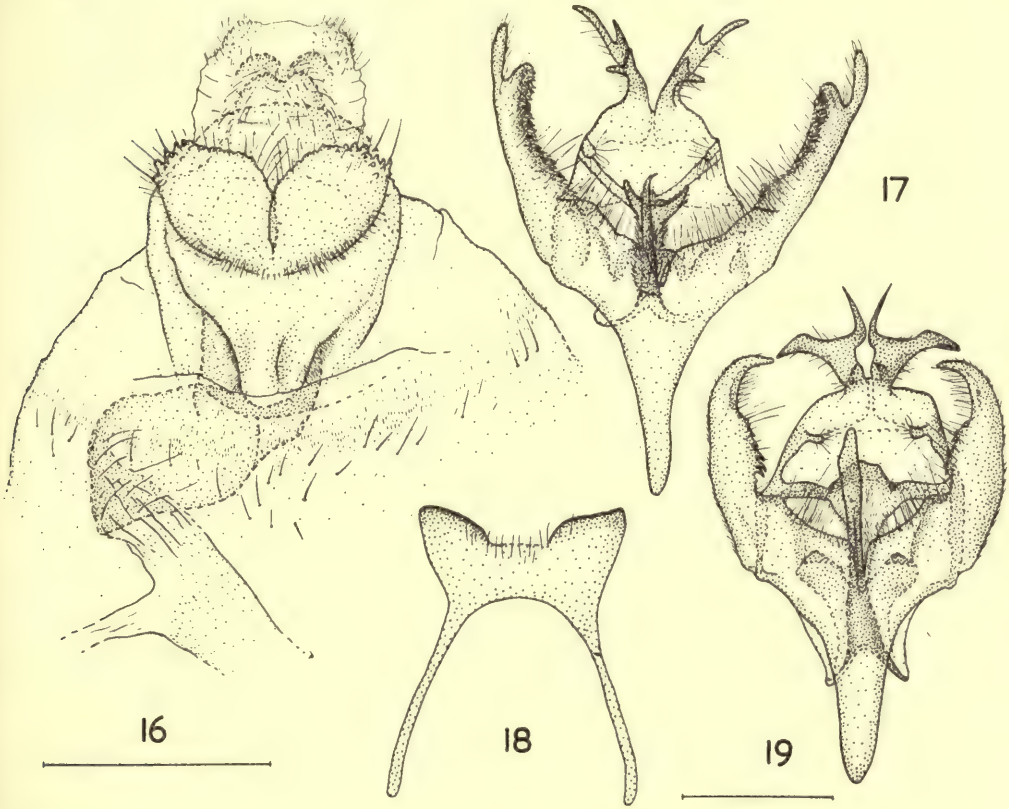
DIAGNOSIS. One of the most easily distinguished species. The upperside of both wings is devoid of all dark markings, the spots and fasciae being indicated by lustrous scales of the ground colour.

DISCUSSION. Warren (1922) created the name *melliflua* as a new name for "*crocea* Hmps. nec Leech", presumably meaning *Tridrepana crocea* (Leech), Hampson. (i.e. a misdetermination by Hampson of specimens of the species now properly called *melliflua* Warren). The name *melliflua* then, was not a new name given by Warren to replace a junior homonym, but the name given by Warren to a then undescribed species.

DISTRIBUTION. Dutch New Guinea.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 6 ♂, 3 ♀, from type

locality; 4 ♂, Snow Mts., Upper Setekwa R., 2–3,000 ft., Aug. 1910, A. S. Meek; 2 ♀, Cyclops Mts., Sabron, Camp 2, 2,000 ft., vi, vii.1936, L. E. Cheesman; 1 ♂, Fak-Fak, 1,700 ft., Dec. '07, Pratt.



FIGS. 16–18. *Tridrepana melliflua* Warren. 16. Female genitalia. 17. Male genitalia. 18. Eighth sternite, male.

FIG. 19. *T. sigma* sp. n., holotype male.

Tridrepana sigma sp. n.

TYPE. Holotype male, Central Buru, Kako, Tagalago, 2,700 ft., May '22, C., F., and J. Pratt; Drepanidae genitalia slide no. 386.

DESCRIPTION: MALE (Pl. 2, fig. 3). 38·7, 36·0–40·4 mm. (4). Head, palps and antennae as for *lunulata fasciata*.

Thorax and abdomen as for *fasciata*. Wings as for *fasciata* but with following differences. Upperside of fore wing with dark patch posterior to posterodistal cell spot larger, extending to Cu_2; anterior markings of subterminal edged distally with larger whitish patch; posterodistal spot of hindwing more strongly edged with dark scales. Underside of fore wing with more clearly marked postmedial

subterminal extending posteriorly to between M_3 and Cu_1, with trace between Cu_1 and Cu_2.

GENITALIA: MALE (Text-fig. 19). Saccus long, digitate, bluntly pointed. Valve long, tapered, arcuate; hood-shaped apically; oblique dentate carina on inner surface of valve. Anellus similar to *fasciata* but with posterior free part differently shaped. Gnathus forming minutely spinose, pyriform pad medially, with strongly sclerotized, raised posterior margin; lateral arms well developed. Socius small. Uncus divided posteriorly into pair of stout, bifurcate arms. Inner cornutus equal in length to one-third length of aedeagus; outer cornutus short, equal in length to one-third length of inner; vesica spinose, group of large spines on side opposite outer cornutus, longest spine longer than greatest width of outer cornutus. Eighth sternite similar to *fasciata*. Eighth tergite not tapered, slightly constricted at half its length, greatest transverse width just less than greatest width of sternite; apodemes equal in length to half anterior width of tergite.

FEMALE. Not known.

DIAGNOSIS. Separated from *fasciata* by the larger dark patch posterior to the posterodistal cell spot in the male fore wing (upperside). Easily distinguished from other members of the species group by the male genitalia.

DISTRIBUTION (Text-fig.154). Buru Is. and Amboina Is.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂, paratype, with same data as holotype; 1 ♂, paratype, Central West Buru, Gamoe, 'Mrapat, 5,000 ft., iii–iv.'22, C.,F., and J. Pratt; 1 ♂ paratype, Amboina, Salahatoe, 1,900 ft., Nov. 1923, C. J. Brooks.

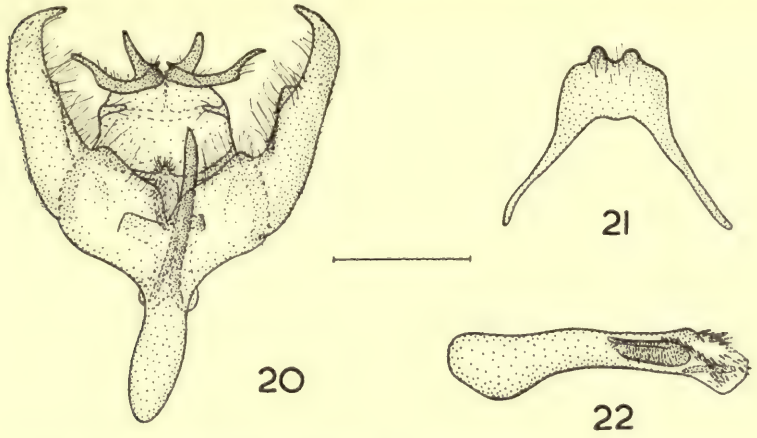
Tridrepana acuta sp. n.

pro parte *Iridrepana albonotata* (Moore), Warren, 1922, *Gross-Schmetterl.* **10**: 464.
pro parte *Tridrepana albonotata* (Moore), Gaede, 1931, *Lepid. Cat.* **49**: 28.

TYPE. Holotype male, Kandy, 9.11; Drepanidae genitalia slide no. 316.

DESCRIPTION: MALE. 34·1, 32·0–35·6 mm. (8). As for *lunulata fasciata* but with following differences. Upperside of both wings with subterminal situated closer to outer margin, more strongly marked; all fasciae more clearly marked, and with more lustrous scales as in *lunulata prolata*. $Sc + R_1$ usually anastomosing with Rs distal to cell in hind wing.

GENITALIA: MALE (Text-figs. 20, 21, 22). Saccus long, digitate. Valve long, tapered, slightly arcuate, apically falcate; dentate carina on inner surface. Anellus similar to *fasciata*, but posterior free process more slender, pointed. Medial pad of gnathus elongate, slightly evaginate, covered with short hair-like spines, with small posterior protuberance; lateral arms well developed. Socius small. Uncus bifurcate posteriorly into two pairs of processes: long ventral pair with indication of apical bifurcation; short dorsal pair, minutely dentate apically. Aedeagus with inner and outer cornutus; vesica strongly spinose with group of spines on side opposite outer cornutus. Eighth sternite with pair of small lobes posteriorly. Eighth tergite quadrate, just wider transversely than greatest width of eighth sternite: apodemes just shorter than half width of tergite.



FIGS. 20–22. *Tridrepana acuta* sp. n., holotype male. 20. Genitalia. 21. Eighth sternite. 22. Aedeagus.

FEMALE. Not known.

DIAGNOSIS. Readily distinguished from *fasciata* and the rest of the species group by the male genitalia.

DISTRIBUTION (Text-fig. 154). Ceylon. Two males and one female from South India may also belong to this species.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 2 ♂ paratypes from type locality; 1 ♂ paratype, Ceylon, Diyatalawa Camp, 4,200 ft., Findlay; 1 ♂ paratype, Haldamulla, 11.34; 1 ♂ paratype, Kegalle, Nov, '09; 1 ♂ paratype, Ceylon; 1 ♂, Ceylon, Uva, 6,000 ft., December.

Tridrepana trialba sp. n.

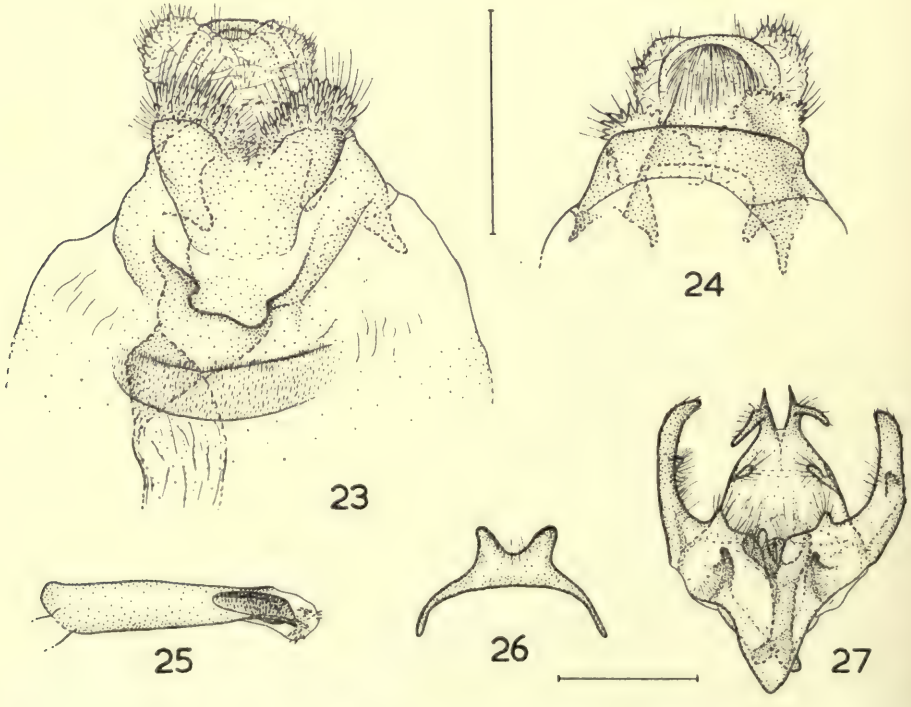
TYPE. Holotype male, W. Celebes, Paloe, G. Rangkoenau, 900 ft., Nov. 1936. J. P. A. Kalis; Drepanidae genitalia slide no. 320.

DESCRIPTION: MALE (Pl. 2, fig. 4.) 31.viii., 27·6–35·0 mm. (52). As for *lunulata fasciata* but with following differences. Upperside of fore wing with mid-cell spot white, not dark brown, edged with OOY–16–12°; discocellular spot also edged with darker scales; darker spot posterior to posterodistal spot larger, discoidal, usually extending to just beyond Cu_1 posteriorly; shade between anterior part of subterminal and outer margin usually not touching M_3 posteriorly; anterior markings of subterminal with whitish distal edges weakly marked or absent. Underside of fore wing with trace of posterodistal spot, discellular spot, and anterior part of postmedial; subterminal developed anteriorly as interneutral spots, well marked between M_1 and M_2.

FEMALE. 38·0, 37·6–38·8 mm. (4). As for male, but with following differences. Longest antennal pectination equal to or just shorter than greatest diameter of eye. Outer margin of fore wing slightly convex, not straight. Upperside of both wings more lustrous, as for *fasciata* female.

GENITALIA : MALE. (Text-figs. 25, 26, 27.) Saccus moderately long, tapered. Valve long, arcuate, slightly tapered. Anellus forming hood-like lobe lateral to base of aedeagus ; each lobe produced anteriorly as flat plate, plates fused medially and produced posteriorly as in *fasciata* ; posterior process two-pronged. Gnathus with hamulate medial spinose process ; lateral arms expanded medially into flat plate. Socius small. Uncus bifurcate posteriorly ; each fork with down-curved, pointed apex, and long, tapered ventral arm. Aedeagus with inner and outer cornutus ; vesica with two main groups of spines, but without group opposite outer cornutus. Posterior margin of eighth sternite deeply emarginate. Eighth tergite just wider at its anterior margin than greatest width of tergite, slightly tapered from anterior margin to nearly half its length, then slightly widened again to posterior margin ; apodemes equal in length to nearly one-third anterior width of tergite.

FEMALE (Text-figs. 23, 24). As for *fasciata* but with following differences. Minutely spinose area at posterior margin of preostial sternite more conspicuous, not extended laterally. Ostium without operculum. Ventral ovipositor lobes differently shaped. Glabrous part of dorsal ovipositor lobes broader, with slight posteromedial emargination.



FIGS. 23 and 24. *Tridrepana trialba* sp. n., allotype female. 23. Ventral view of ostium and ovipositor lobes. 24. Dorsal view of ovipositor lobes.

FIGS. 25–27. *T. trialba* sp. n., holotype male. 25. Aedeagus. 26. Eighth sternite. 27. Genitalia.

DIAGNOSIS. Distinguished from all other species of the species group by the white (not brown) mid-cell spot on the upperside of the fore wing.

DISTRIBUTION (Text-fig. 154). Celebes.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : allotype ♀, W. Celebes, Paloe, Sidaonta 4,500 ft., June 1937, J. P. A. Kalis, Genitalia slide No. 318 ; 1 ♀, 11 ♂ paratypes, 5 ♂, with same data as holotype ; 1 ♂ paratype, 1 ♂, Paloe Sidaonta, 4,500 ft., June 1937, J. P. A. Kalis ; 5 ♂ paratypes, 7 ♂, Paloe, Rangkoenau, 1,800 ft., Dec. 1936, J. P. A. Kalis ; 4 ♂ paratypes, 1 ♂, 1 ♀, Paloe, Koelawi, 3,100 ft., February, March, 1937, J. P. A. Kalis ; 1 ♀ paratype, 2 ♂, S. W. Celebes, Tjamba, nr. Maios, 1,500 ft., February 1938, J. P. A. Kalis ; 1 ♂, Pangean, nr. Maros, 2,000 ft., March 1938. RIJKSMUSEUM VAN NATUURLIJKE HISTORIE, LEIDEN : 1 ♂, paratype, N. Celebes, P. Jv. d. Bergh.

Tridrepana spatulata sp. n.

Drepana fulvata Snellen, Strand, 1922, *Arch. Naturgesch.* A8 : 268.

TYPE. Holotype male, Luzon, Rizal, Montalban, 26 March 1914, A. E. Wileman ; Drepanidae genitalia slide no. 270.

DESCRIPTION : MALE. 33·0, 31·0–35·0 mm. (4). As for *trialba*, but upperside of both wings with more numerous lustrous scales, especially on and near subterminal fascia, and with dark brown, not white, mid-cell spot.

FEMALE. 38·4 mm. (1). As for *trialba* female, but with differences given above for *spatulata* male.

GENITALIA : MALE (Text-figs. 28, 29, 30). Saccus moderately long, tapered. Valve long, tapered, arcuate ; dentate carina on inner surface. Anellus similar to *lunulata fasciata*, but posterior process apically spatulate, dentate laterally near base. Gnathus with short, bluntly pointed medial process with patch of minute hair-like spines near its base ; lateral arms broad, weakly sclerotized. Socius small. Uncus similar to *trialba*, but of different proportions, ventral arms larger, directed posteriorly. Aedeagus with inner and outer cornutus ; vesica spinose, group of long spines on side opposite outer cornutus. Posterior margin of eighth sternite concave. Eighth tergite as wide anteriorly as greatest width of eighth sternite ; slightly widened posteriorly to half its length, then tapered to posterior margin ; convex laterally ; posterior margin about half length of anterior margin ; apodemes about one-third anterior margin.

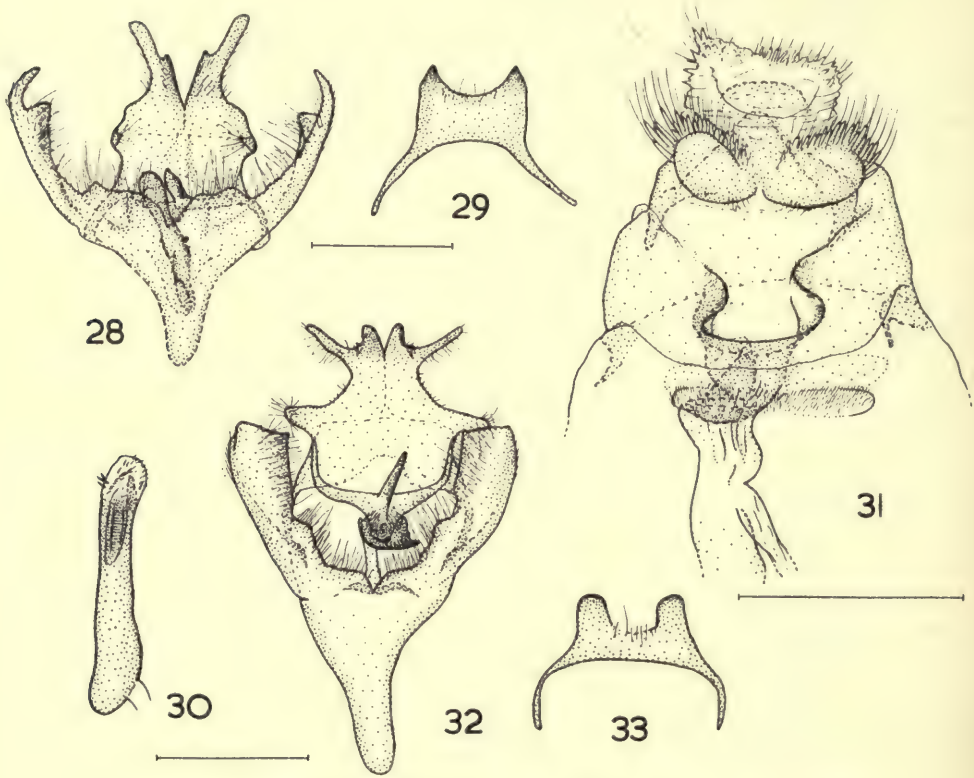
FEMALE. (Text-fig. 31). As for *trialba*, but with following differences : spinose patch at posterior margin of preostial sternite narrower ; bulges at sides of ostium larger; ventral ovipositor lobes differently shaped ; glabrous part of dorsal ovipositor lobes less well developed, no trace of medial emargination.

DIAGNOSIS. The shape of the gnathus and the posterior part of the anellus in the male distinguish the species from its closest relative, *trialba*. In the female the genitalia is equally distinctive.

DISTRIBUTION (Text-fig. 154). Philippine Is.

MATERIAL EXAMINED. DEUTSCHES ENTOMOLOGISCHES INSTITUT, BERLIN : allotype ♀, Luzon, Benguet, W. Schultze, Drepanidae genitalia slide no. 473. BRITISH

MUSEUM (NAT. HIST.) : 1 ♂ paratype, Luzon, Benguet, Palali, 2,000 ft., 26.xii.1912, A. E. Wileman ; 1 ♂ Luzon, Benguet, Klondyke, Camp 1, 800 ft., 16.iv.1912, A. E. Wileman ; 1 ♂ paratype, Mindanao, Lanao, Kolambugan, sea level, 25.5.1914, A. E. Wileman.



FIGS. 28–30. *Tridrepana spatulata* sp. n., holotype male. 28. Genitalia. 29. Eighth sternite. 30. Aedeagus.

FIG. 31. *T. spatulata* sp. n., allotype female, ostium and ovipositor lobes.

FIGS. 32 and 33. *T. arikana arikana* (Matsumura), male. 32. Genitalia. 33. Eighth sternite.

Tridrepana arikana arikana (Matsumura) (comb. nov.)

Konjikia arikana Matsumura, 1921, *Thous. Ins. Japan, Addit.* **4** : 949.
Drepana fulvata Snellen, Strand, 1915, *Arch. Naturgesch.* A**12** : 164.

TYPE. Type material presumably deposited at the University of Hokkaido, Japan ; not examined. Described from Formosa.

DESCRIPTION : MALE (Pl. 2, fig. 5). 37·2, 35·0–39·4 mm. (2). As for *lunulata fasciata*, but with following differences. Forewing more strongly falcate. Upperside of fore wing with mid-cell spot, anterodistal spot and discocellular spot all

diffusely edged with O–12–6° ; dark spot posterior to posterodistal spot also diffusely edged with same colour ; subterminal less distinctly marked.

GENITALIA : MALE (Text-figs. 32, 33). Saccus long, digitate. Valve moderately long, slightly arcuate, apically truncate. Anellus weakly sclerotized at base of aedeagus ; each side produced as in *fasciata*, bands fused with each other medially and produced posteriorly as narrow band to anterior margin of gnathus, then sharply reflexed to form strongly sclerotized, two-pronged plate closely apposed to gnathus. Gnathus with long, conical, posteroventrally directed process medially, with small pad at its base covered with minute hair-like spines ; lateral arms broad medially, gradually tapered laterally. Socius small, broad. Uncus bifurcate posteriorly ; each fork tapered, bluntly pointed, apically downcurved, with small lateral tooth and long digitate ventral arm. Aedeagus with inner and outer cornutus ; vesica armoured with short spines. Posterior margin of eighth sternite deeply emarginate medially. Eighth tergite quadrate, very slightly constricted at middle, nearly three times as long as its least transverse width, equal in width to greatest width of eighth sternite ; apodemes equal in length to one third width at anterior margin of tergite.

FEMALE. Not known.

DIAGNOSIS. Distinguished from other species of the species group by the more strongly falcate apex of the fore wing and the very distinctive genitalia.

DISTRIBUTION. Formosa. A male from South China, Ling-ping (in Höne Coll., Zool. Forschungsinstitut, Bonn) probably belongs to this race.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 1 ♂ Formosa det. H. Inoue, 1954. DEUTSCHES ENTOMOLOGISCHES INSTITUT, BERLIN : 1 ♂ Formosa, Alikang, Sauter, 09.

Tridrepana arikana falcipennis Warren (comb. nov., stat. nov.)

Iridrepana falcipennis Warren, 1922, *Gross-Schmetterl.* **10** : 464.
Tridrepana falcipennis Warren, Gaede, 1931, *Lepid Cat.* **49** : 29.

TYPE. I select the following specimen as lectotype. Lectotype male, Bhutan, Sept. 1889, O. Moller ; Drepanidae genitalia slide no. 146.

DESCRIPTION : MALE. 20·0 mm. (1). Similar to nominate race. (More material needed for accurate description.)

FEMALE. 22·8 mm. (1). As for male.

GENITALIA : MALE. Outer lateral surface of each posterior process of uncus with strongly toothed carina.

FEMALE. (Abdomen missing.)

DISTRIBUTION : Bhutan. One male from South China, Canton (in Zool. Mus., Berlin) appears to be more closely related to this race than to the Formosan race.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : syntype ♀, Bhutan, Sept. 1868, O. Moller.

Species group ***albonotata*** Moore

The combination of two medial spots on the upperside of the fore wing and a

double postmedial (at least posteriorly) on the upperside of the hind wing distinguishes this group of six species from the remaining species groups. In the male genitalia the anellus is well developed (except in *microcrocea*), and the medial part of the gnathus can be divided into a convex strongly spinose or tuberculate anterior part, and a free posterior part forming a sub-anal flap. The spermatheca in the female genitalia is minutely scobinate with a very short duct and laminate signa in *albonotata*, *mediata* and *aequinota*; in *obscura* and *microcrocea* the spermatheca is radially ornamented and its duct long (as in *fulvata*); in *sera* the spermatheca and duct are similar to *obscura* but the bursa copulatrix is without signa.

The species *albonatata*, *aequinota* and *mediata* form a single superspecies. *albonatata* is polytypic, breaking up into six subspecies.

Polymorphism is apparently absent, but it is interesting to note that the brown coloration of the upperside of all the specimens of *mediata* examined is paralleled in *olivacea* where both brown and yellow forms occur.

microcrocea possesses a patch of dark thickened (sensory?) scales at the base of the cell on the underside of the fore wing in the male.

Tridrepana albonotata albonotata (Moore)

Drepana albonotata Moore, 1879, *Descr. Lep. Atk.* p. 83.
Drepana albonotata Moore, Cotes and Swinhoe, 1887, *Cat. Moths. India* p. 184.
Drepana albonotata Moore, Hampson, 1893, *Fauna Brit. India Moths* **1** : 340.
Callidrepana albonotata (Moore), Kirby, 1892, *Syn. Cat. Lep. Het.* p. 730.
Drepana albonotata Moore, Hamson, 1897, *J. Bombay Nat. Hist. Soc.* (2) **11** : 288.
Drepana albonotata Moore, Dudgeon, 1899, *J. Bombay nat. Hist. Soc.* (4) **12** : 654.
Tridrepana albonotata (Moore), 1895, *Trans. R. ent. Soc. Lond.* **1895** : 4.
Tridrepana albonotata (Moore), Gaede, 1931. *Lepid. Cat.* **49** : 28.
Callidrepana ochrea Butler, 1886, *Ill. Lep. Brit. Mus.* **6** : 17. (India : Darjeeling.)
Callidrepana ochrea Butler, Cotes and Swinhoe, 1887. *Cat. Moths India* p. 186.
Callidrepana ochrea Butler, Kirby, 1892, *Syn. Cat. Lep. Het.* p. 730.
Tridrepana fulvata (Snellen), Warren, 1903. *Novit. zool.* **10** : 346.
Iridrepana glaciata Warren, 1922, *Gross-Schmetterl.* **10** : 467. (Sikkim). (SYN. NOV.)
Tridrepana glaciata Warren, Gaede, 1931. *Lepid. Cat.* **49** : 29.

TYPE. The British Museum (Nat. Hist.) posseses a male labelled in Moore's own handwriting "*Drepana albonotata* Moore, type". This specimen, however, was collected from Darjeeling, not from the published type locality, "Mount Parisnath, Bihar".

DESCRIPTION : MALE. 31·2, 30·0–33·4 mm. (5). Outer surface of palp O–17–11°; slightly paler inside. Head OOS–9–12°, to O–18–12° above labrum; Antenna OOY–18/19–11°, bipectinate plumose, longest pectination one and one-quarter times as long as greatest diameter of eye.

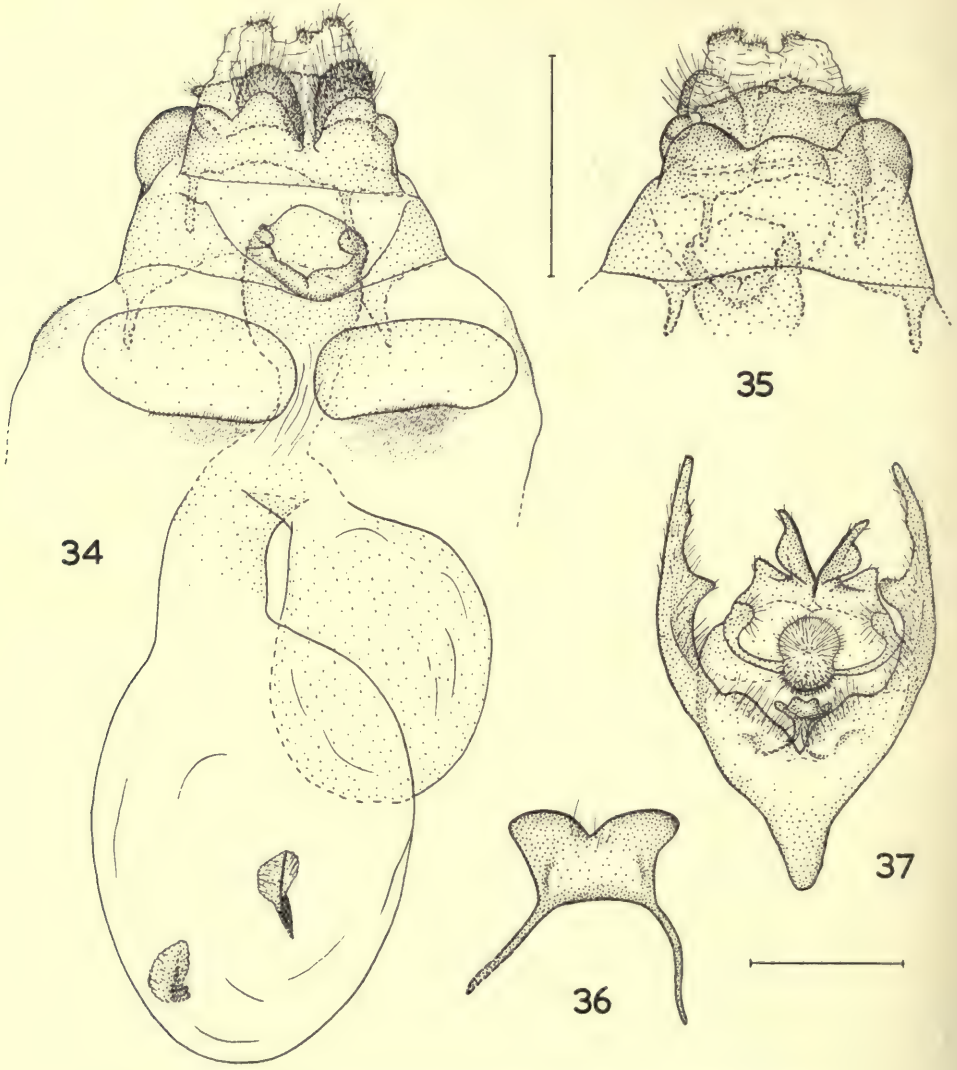
Thorax with narrow whitish anterior border; rest of thorax and abdomen OY–19–12° above, much paler beneath. Fore wing moderately falcate, outer margin straight except at apex; venation as for *fulvata*. Ground colour of upperside of both wings OOY–18/19–11°. Costa of fore wing irrorated with O–4–11°; antemedial as for *fulvata*, O/OOY–14–11°; whitish discocellular spot and similarly

coloured but larger posterodistal spot, both edged with O–9–11° ; postmedial as for *fulvata*, slightly darker than antemedial, diffusely marked near costa, most strongly marked near inner margin ; diffuse medial shade, narrow posteriorly on either side of postmedial, widened anteriorly, extending from middle of costa to apex of wing, O/OOY–14–11° ; subterminal as for *fulvata*, OOS–3–6°, anterior markings edged distally with whitish scales; marginal shade distal to anterior part of subterminal extending posteriorly to between M_3 and Cu_1, O–9–11° ; fringe bordering shade similarly coloured. Whole of wing lustrous, except for narrow area proximal to subterminal and immediately distal to medial shade, area distal to subterminal posterior to M_3, and dark markings of subterminal between R_4 and M_3. Hind wing venation as for *fulvata* but with Sc + R_1 usually anastomosing with Rs distal to cell for short distance. Trace of antemedial, as in *fulvata* ; discocellular spot O/OOY–14–11° ; whitish posterodistal spot broadly edged with colour of latter spot ; postmedial fascia double ; strongly marked, slightly lunulate proximal line corresponding to postmedial of *fulvata*, and faintly marked non-lunulate distal line diverging at either end from proximal line ; subterminal as for *fulvata*. Colour of fasciae as for fore wing. Lustrous areas as for fore wing but whole of area distal to subterminal lustrous. Underside of both wings OY–19–12°, slightly paler posteriorly in fore wing. Fore wing : costa irrorated with O/OOY–14–11° ; trace of anterior part of distal line of postmedial (not corresponding to more proximally situated line on upperside) and anterior part of subterminal. Hind wing unmarked.

FEMALE. 40·8, 39·4–42·8 mm. (3). As for male, but with following differences. Antennae minutely bipectinate, each pectination with apical tuft of cilia, longest pectination just longer than diameter of antennal shaft at that point. Outer margin of fore wing convex, not straight. Upperside of fore wing sometimes with additional minute whitish spot on Cu_1 posterior to posterodistal spot.

GENITALIA : MALE. (Text-figs. 36, 37.) Saccus moderately long, slightly tapered. Valve long, tapered slightly arcuate (small distal bulge absent in some specimens). Anellus only developed lateral and dorsal to base of aedeagus : narrow lateral band on each side extending posteriorly, bands uniting with each other medially to form broad concave structure, scobinate posteriorly and minutely spinose anteriorly ; each lateral edge of latter produced dorsally as flattened lobe. Gnathus with medial, evaginate pad, covered ventrally with hair-like spines, produced posteriorly as free flap ; lateral arms well developed. Socius small, rounded. Uncus with bluntly pointed posterior shoulders ; bifurcate nearly to base medially, each arm slightly downcurved with flattened dorsolateral bulge near base. Aedeagus with inner and outer cornutus ; vesica minutely spinose (as for *angusta*). Eighth sternite as in figure. Eighth tergite quadrate, about one and a half times as long as its least transverse width, just narrower anteriorly than greatest width of eighth sternite ; slightly expanded from anterior margin to two-thirds of its length then tapered to posterior margin, laterally convex, posterior margin about three-quarters width of anterior margin.

FEMALE (Text-figs. 34, 35). Preostial segment with minutely spinose patch posteriorly on either side of medial line and broad concave plate posterior to each patch. Bursa copulatrix large ; pair of signa, each strongly invaginate medially,



FIGS. 34 and 35. *Tridrepana albonotata albonotata* (Moore), female. 34. Ventral view. 35. Dorsal view.
FIGS. 36 and 37. *T. a. albonotata* (Moore), male. 36. Eighth sternite. 37. Genitalia.

laminate. Ductus bursae minutely scobinate for short distance anterior to opening of spermathecal duct, and rimose posterior to opening ; well sclerotized posteriorly. Ostium with lateral and anterior lobes. Spermatheca lightly and minutely scobinate ; duct short. Ostial segment greatly developed dorsally, trilobed posteriorly and produced over base of ovipositor lobes. Ventral ovipositor lobes well sclerotized basally, papillate and hairy posteriorly, each with small lateral

lobe. Dorsal ovipositor lobes united to form broad hood-like structure, slightly produced posterolaterally, weakly emarginate medially.

DIAGNOSIS. Separated from *obscura* by the better defined colour pattern of the upperside and from *microcrocea* by the more extensive medial shade on the fore wing. Genitalia: in the male the shape of the uncus, and in the female the short spermathecal duct and absence of radial ornamantation on the spermatheca, distinguishes the species from those mentioned above.

DISCUSSION. Apart from the " type speciman ", there is a further speciman of special interest: this is a female from the Atkinson Collection (in Zool. Mus., Berlin) labelled " Parisnath " (the type locality). The speciman is fortunately conspecific with the former.

The male and female illustrated by Warren (1922) as *albonotata*, belong to *fulvata brevis*.

DISTRIBUTION (Text-fig. 155). Sikkim, N. India and Saigon.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂, Darjiling (holotype of *ochrea* Butler); 1 ♂, 1 ♀, Sikkim; 1 ♂, Sikkim, 4–7,000 ft., Möller; 1 ♂, Sikkim, 1894, Chausseurs Indigènes, R. P. Bretaudeau; 1 ♀, Darjeeling, 1891, Mowis. MUSEUM NATIONAL D'HISTOIRE NATURELLE, PARIS: 1 ♀, Saigon, vi.1911. ZOOL. MUSEUM, BERLIN: 1 ♀, Parisnath.

Tridrepana albonotata angusta ssp. n.

TYPE. Holotype male, S.E. Borneo, Samarinda, x.1938, M. E. Walsh; Drepanidae genitalia slide no. 191.

DESCRIPTION: MALE. 31·0, 28·0–32·4 mm. (14). As for nominate race but with following differences. Upperside of fore wing with anterior subterminal markings more distinct; marginal shade distal to anterior part of subterminal, extending posteriorly to Cu_1; outer line of postmedial of hind wing more distinct anteriorly. Underside of fore wing with trace of posterodistal spot; outer line of postmedial well marked between R_4 and M_3; anterior part of subterminal strongly marked between apex and M_2, O–5–6°; marginal shade and fringe similarly coloured but paler.

GENITALIA: MALE. (Text-figs. 38, 39, 40.) As for nominate race but with following differences. Larger of distal lobes on inner surface of valve sharply pointed. Posterior concave part of anellus larger and deeper, cup-like. Gnathus differently shaped medially. Posterior shoulders of uncus only slightly produced; medial arms without dorsolateral bulge. Eighth sternite differently shaped posteriorly.

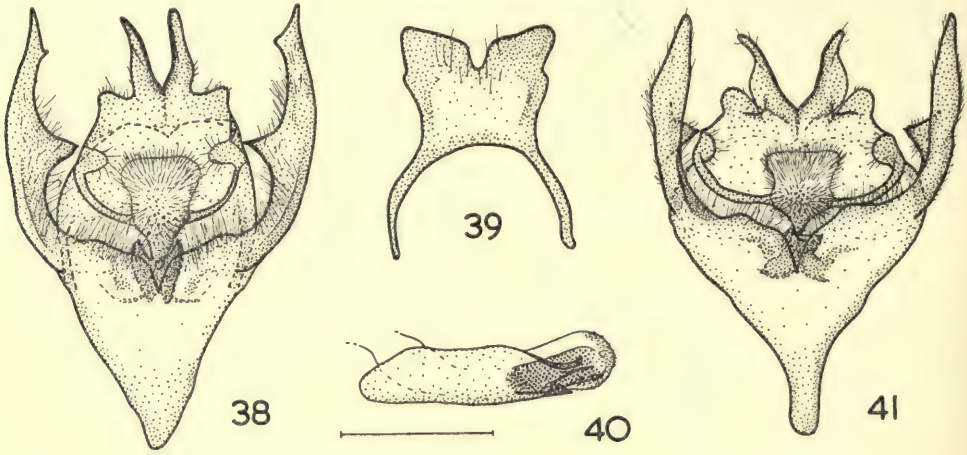
FEMALE. Not known.

DIAGNOSIS. Distinguished from the other races of the species chiefly by the shape of the uncus in the male genitalia.

DISTRIBUTION (Text-fig. 155). Borneo, Sumatra and Malaya.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 3 ♂ paratypes, with same data as holotype; 1 ♂, B. N. Borneo, Kretam, 6.vii.1950, J. D. H. Hedley; 1 ♂ paratype, Sarawak, Bidi, 1907–1908, C. J. Brooks; 1 ♂ paratype, S. W. Sumatra,

Barisan Range, Western slopes, 2,500 ft., Oct.–Nov. 1931, C., F., and J. Pratt; 1 ♂, Sumatra, Dempo, 4,000 ft., vii.1923, C. J. Brooks; 1 ♂ paratype, Gunong Ijau, 2–3000 ft., iii.'98, Butler; 1 ♂ paratype, Penang, ii.'97, Curtis; 4 ♂ paratypes, 1 ♂, Malay Penin., Selangor, Bukit Kutu, 3,300–3,500 ft., April 1926, Sept. 1932,



FIGS. 38–40. *Tridrepana albonotata angusta* ssp. n., holotype male. 38. Genitalia. 39. Eighth sternite. 40. Aedeagus.

FIG. 41. *T. a. rotunda* ssp. n., holotype male, genitalia.

H. M. Pendlebury; 5 ♂, Kuala Lumpur, Jan. 17, 22, Nov. 21, Oct, 25, 1921, 1931. LANDBOUWHOGESCHOOL TE WAGENINGEN: 1 ♂ paratype, O. Borneo, 13 Dec. 1936, Qu. de Quarles. NATURHISTORISCHES MUSEUM, VIENNA: 4 ♂ paratypes, Malacca, Tras Pahang, 1912, Popp.

Tridrepana albonotata rotunda ssp. n.

TYPE. Holotype male, W. Bali, Mondoktoempang, 2,500 ft., October 1934, J. P. A. Kalis; Drepanidae genitalia slide no. 180.

DESCRIPTION: MALE. 34·8, 32·4–36·0 mm. (5). As for nominate race but with following differences. Anterior part of subterminal on upperside of fore wing more strongly marked, as in *angusta*. Posterodistal spot on hind wing may extend as minute streak along base of M_2; Outer line of postmedial well developed as in *angusta*.

GENITALIA (Text-fig. 41). As for nominate race but with following differences. Lobe on inner surface near half length of valve, larger and dilated, not laterally flattened, sometimes with few teeth at apex. Anellus similar to *angustu* but with ventral margin of cup-like structure flat medially, not evenly convex. Medial part of gnathus differently shaped, similar to *angusta* but more sharply tapered anteriorly. Posterior shoulders of uncus evenly rounded, not bluntly pointed. Inner cornutus of aedeagus smaller (as for *celebesensis*). Eighth sternite as for *angusta*.

FEMALE. Not known.

DIAGNOSIS. The shape of the uncus shoulders and the gnathus distinguish this from the other races of the species.

DISTRIBUTION (Text-fig. 155). Bali. Two females from W. Java (in Rijksmuseum van Nat. Hist., Leiden), and two Females from E. Java (in Brit. Mus. (Nat. Hist.)) probably belong to this race.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 3 ♂ paratypes, with same data as type; 1 ♂, E. Bali, Git-Git, 5,000 ft., April 1926, J. P. A. Kalis.

Tridrepana albonotata celebesensis ssp. n.

TYPE. Holotype male, W. Celebes, Paloe, G. Tompoe, 2,700 ft., Jan. 1937, J. P. A. Kalis; Drepanidae genitalia slide no. 361.

DESCRIPTION: MALE (Pl. 2, fig. 6). 33·4, 30·0–36·2 mm. (29). As for nominate race but with following differences. Anterior part of subterminal on upperside of fore wing as for *angusta*, but with associated marginal shade not extending beyond M_3 posteriorly. Posterodistal spot on hind wing may extend a short distance along M_3 and for a shorter distance along M_2; usually with additional white streak along base of Cu_1 at end of cell; distal line of postmedial usually only well marked posteriorly. Underside as for *angusta*.

FEMALE. (Pl. 2, fig. 7). 43·6 mm. (1). As for male but with following differences. Antennae minutely bipectinate as in nominate race. Outer margin of fore wing slightly convex; distal line of postmedial on upperside well marked anteriorly; subterminal of both wings with more lustrous scales.

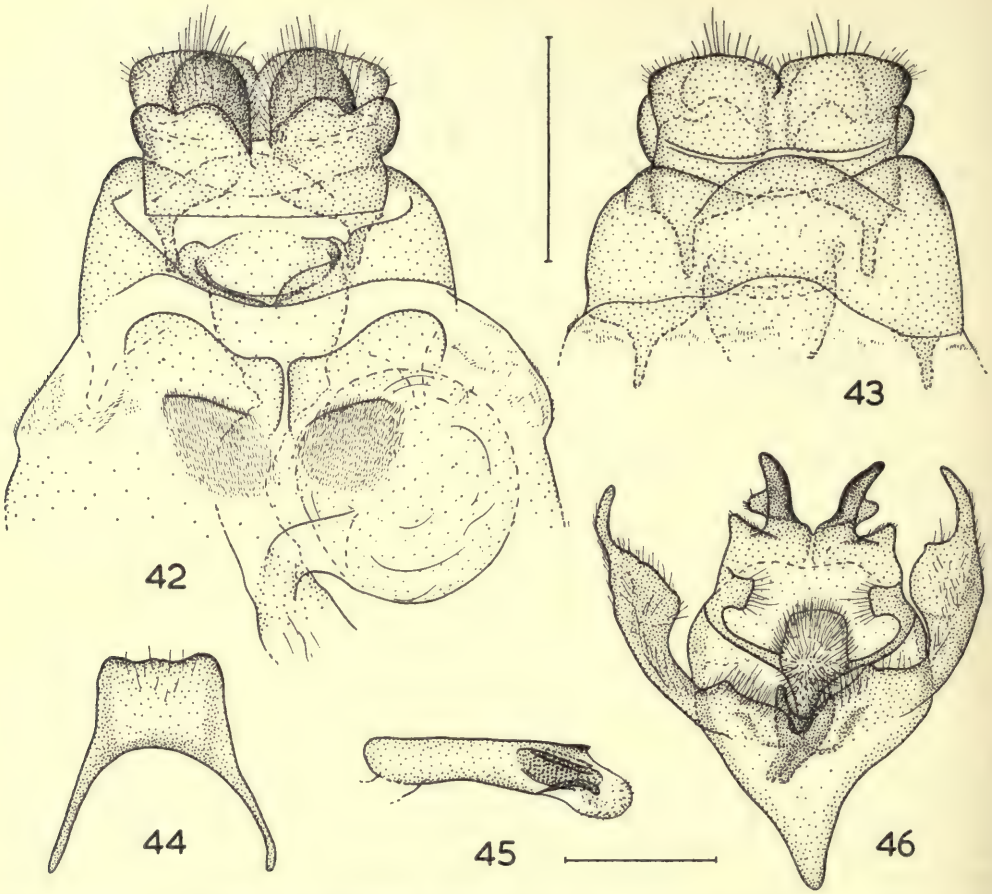
GENITALIA: MALE (Text-figs. 44, 45, 46). As for nominate race but with following differences. Large, dilated, posterodorsally truncate lobe on inner surface of valve near apex. Cup-like part of anellus similar to *angusta* but slightly larger; anterodorsal lobes more conspicuous. Gnathus similar to *angusta* but posterior flap narrower posteriorly. Socius truncate. Each medial process of uncus with conspicuous dorsolateral lobe near base. Aedeagus as for *rotunda* (Text-fig. 45). Eighth sternite with only trace of posteromedial emargination. Eighth tergite about one and a quarter times as long as its least transverse width, slightly less wide posteriorly than anteriorly.

FEMALE (Text-figs. 42, 43). As for nominate race but with following differences. Preostial plates and spinose patches differently shaped. Ostial lobes as in figure. Medial lobe of dorsoposterior margin of ostial segment broader than lateral lobe. Dorsal ovipositor lobes larger, differently shaped.

DIAGNOSIS. Distinguished from the other races of the species by the shape of the eighth sternite, valve and uncus in the male, and by the larger dorsal ovipositor lobes in the female.

DISTRIBUTION (Text-fig. 155). Celebes.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): allotype ♀, W. Celebes, Paloe, G. Tompoe, 2,700 ft., Feb. 1937, J. P. A. Kalis, Drepanidae genitalia slide no. 352; 2 ♂ paratypes, with same data as holotype; 4 ♂ paratypes, 1 ♂, Paloe, Loda, 4,000 ft., May 1937, J. P. A. Kalis; 2 ♂ paratypes, Paloe, Lindoe, 3,700 ft.,



FIGS. 42 and 43. *Tridrepana albonotata celebesensis* ssp. n., allotype female. 42. Ventral view. 43. Dorsal view.

FIGS. 44–46. *T. a. celbesensis* ssp. n., holotype male. 44. Eighth sternite. 45. Aedeagus. 46. Genitalia.

April 1937, J. P. A. Kalis; 7 ♂ paratypes, 1 ♂, Paloe, Koelawi, 3,100 ft., March 1937, J. P. A. Kalis; 12 ♂ paratypes, Paloe, Sidaonta, 4,500 ft., June 1937, J. P. A. Kalis.

Tridrepana albonotata ferrea (Hampson) (stat. nov.)

Agnidra ferrea Hampson, 1892, *Ill. Lep. Het. Brit. Mus.* **9** : 69.
Drepana ferrea (Hampson), Hampson, 1893, *Fauna Brit. India Moths* **1** : 341.
Iridrepana ferrea (Hampson), Warren, 1922, *Gross-Schmetterl.* **10** : 466 (fig.)
Tridrepana ferrea (Hampson), Gaede, 1931, *Lepid. Cat.* **49** : 29.

TYPE. Holotype male, Ceylon, Pundaloya; Drepanidae genitalia slide no. 360.

DESCRIPTION: MALE. 31·4, 30·8–36·4 mm. (4). As for nominate race but with following differences. Fore wing more strongly falcate. Upperside of the fore wing

with more strongly marked medial shade, OOS–9–6°, extending nearly to antemedial proximally; rest of wing OOY–17–11°; anterior part of subterminal more strongly marked as in *angusta*. Hind wing with similar medial shade. Underside of fore wing darker than in nominate race, OOY–16–10°; discocellular spot strongly marked. Ground colour of hind wing also darker.

FEMALE. 40·6, 39·4–41·6 mm. (3). As for male but with following differences. Antennae minutely bipectinate. Ground colour of upperside of both wings paler (but specimens worn), medial shade O–4–7° and rest of wing O–17–11°; subterminal with more lustrous scales.

GENITALIA. As for nominate race but with following differences:

MALE. (Text-figs. 48, 49). Valve shorter, greatly dilated apically and obliquely truncate posterodorsally. Cup-like part of anellus more strongly produced ventrolaterally. Medial part of gnathus differently shaped. Posterior shoulders of uncus much longer, downcurved; medial processes diverge more strongly from each other posteriorly. Posterior margin of eighth sternite with broad, deep, medial emargination.

FEMALE. (Text-fig. 47). Ostial margin not conspicuously lipped. Lateral lobes of posterior margin of ostial segment larger; medial lobe poorly developed. Dorsal hood-like structure without posteromedial division into ovipositor lobes.

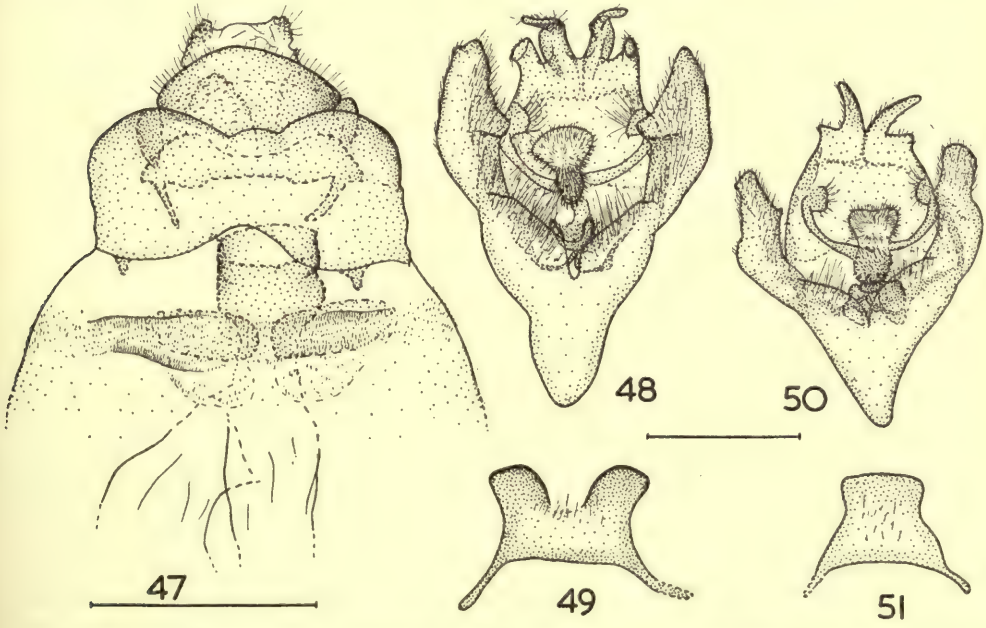


FIG. 47. *Tridrepana albonotata ferrea* (Hampson), female, dorsal view of genitalia.

FIGS. 48 and 49. *T. a. ferrea* (Hampson), male. 48. Genitalia. 49. Eighth sternite.

FIGS. 50 and 51. *T. a. pervasata* Warren, holotype male. 50, Genitalia. 51. Eighth sternite.

DIAGNOSIS. Separated from the other races of the species by the darker coloration and the presence of a medial shade in both fore and hind wing.

GENITALIA : the shape of the eighth sternite and the uncus in the male, and the greatly enlarged dorsolateral lobes of the posterior margin of the ostial segment in the female, distinguish this from the other races.

DISTRIBUTION (Text-fig. 155). Ceylon.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 4 ♂, 1 ♀, Ceylon, Maskeliya, February, April, June, J. P.; 1 ♀, Ceylon.

Tridrepana albonotata pervasata Warren (comb. nov.)

Iridrepana septumpunctata pervasata Warren, 1922, *Gross-Schmetterl.* **10** : 465.
Tridrepana septumpunctata var. *pervasata* Warren, Gaede, 1931, *Lepid Cat.* **49** : 30.

TYPE. Holotype male, Travancore, Place ; Drepanidae genitalia slide no. 186.

DESCRIPTION : MALE. 30·0 mm. (1). As for *ferrea* but with ground colours of wings slightly less dark, and fore wing less strongly falcate.

GENITALIA : MALE. (Text-figs. 50, 51). As for nominate race but with following differences. Valve similar to *ferrea* but less strongly dilated apically. Cup-like part of anellus with ventral corners weakly produced ; dorsal lobes also poorly developed. Medial part of gnathus differently shaped. Socius apically truncate. Uncus as for *angusta* but with medial process shorter. Eighth sternite truncate posteriorly, without medial emargination. Eighth tergite only slightly wider anteriorly than posteriorly.

FEMALE. Not known.

DIAGNOSIS. The shape of the eighth sternite readily distinguishes this from the nominate race.

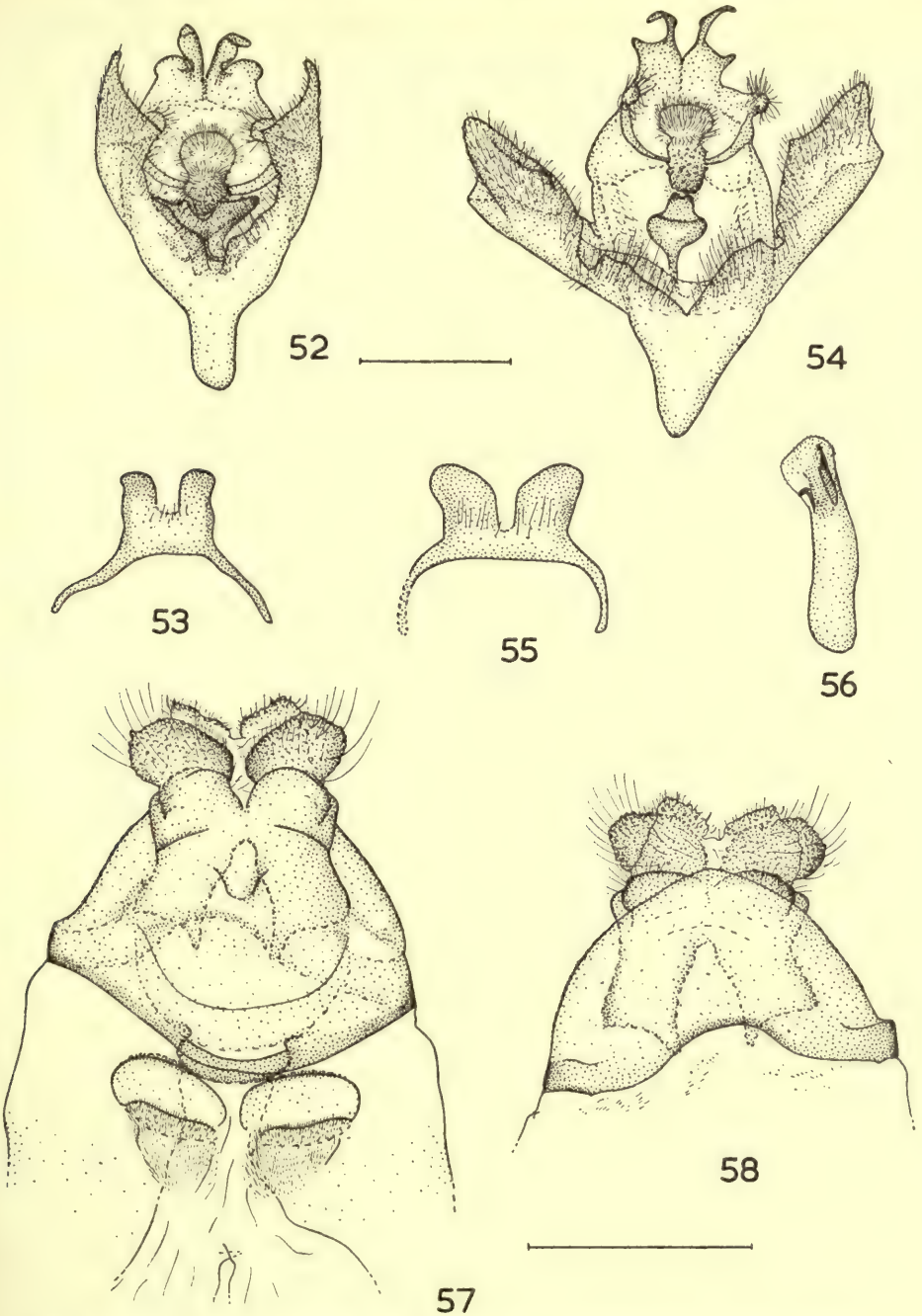
DISTRIBUTION (Text-fig. 155). S. India.

No material apart from the holotype available for study.

Tridrepana aequinota sp. n.

TYPE. Holotype male, Central Buru, Kako Tagalago, 2,700 ft., May '22, C., F., and J. Pratt ; Drepanidae genitalia slide no. 425.

DESCRIPTION : MALE. (Pl. 2, fig. 8). 33·1, 31·8–34·6 mm. (3). As for *albonotata angusta* but with following differences. Upperside of fore wing with base of costa irrorated with O–13–11° ; antemedial and postmedial fasciae darker, OOS–3–8° ; discocellular spot darker and larger, OOS–3–8°, without white centre ; posterodistal spot edged with OOS–3–8° ; anterior markings of subterminal not conspicuously enlarged, marking between M_1 and M_2 largest ; narrow marginal shade from apex to M_3, OOS–5–12° ; fringe bordering shade OOS–3–8° : hind wing with distal line of postmedial indistinct, not developed anteriorly ; posterodistal spot edged with darker scales as in fore wing. Underside of fore wing with well marked discocellular spot ; trace of subterminal anteriorly : posterodistal spot on hind wing shows through from upperside.



FIGS. 52 and 53. *Tridrepana aequinota* sp. n., holotype male. 52. Genitalia. 53. Eighth sternite.

FIGS. 54–56. *T. mediata* Warren, male. 54. Genitalia. 55. Eighth sternite. 56. Aedeagus.

FIGS. 57 and 58. *T. mediata* Warren, female. 57. Ventral view. 58. Dorsal view.

GENITALIA : MALE (Text-figs. 52, 53). Saccus moderately long, digitate. Valve arcuate, apically pointed : greatly dilated just proximal to apex, obliquely truncate posterodorsally (similar to *albo. celebesensis*). Anellus similar to *albonotata* but much larger, posteroventral margin of cup-like structure strongly emarginate. Gnathus similar to *albonotata*. Socius small, rounded. Uncus as for *albo. rotunda* but much less broad. Aedeagus as for *albo. albo*. Eighth sternite deeply emarginate posteriorly (similar to *albo. ferrea*). Eighth tergite as for *albo. albo*.

FEMALE. Not known.

DIAGNOSIS. Distinguished from *albonotata* by the more uniformly marked subterminal on the upperside of the fore wing.

DISCUSSION. As noted previously, this species belongs to the superspecies *albonotata*.

DISTRIBUTION (Text-fig. 155). Buru.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 2 ♂ paratypes, with same data as holotype.

Tridrepana mediata Warren

Iridrepana mediata Warren, 1922, *Gross-Schmetterl.* **10** : 467 (fig.).
Tridrepana mediata Warren, Gaede, 1931, *Lepid Cat.* **49** : 29.

TYPE. Holotype female, Dutch New Guinea, up to 3,500 ft., nr. Oetakwa R., x.xii.1910, Meek ; Drepanidae genitalia slide no. 359.

DESCRIPTION : MALE. 32·0, 29·4–33·4 mm. (5). Palps, and head between and posterior to antennae O–15–12° ; head anterior to antennae OOS–8–11°, to OOY–16–9° above labrum ; antennae OOY–16–9°, irrorated proximally with OOS–8–11°, shape as for *albonotata*.

Thorax with narrow whitish anterior border ; rest of thorax and abdomen OOS–9–5° above, OOY–18–10° below. Wing shape and pattern as for *albonotata angusta*. Ground colour of upperside of fore and hind wing as for thorax ; medial shade and outer margin shade of fore wing and fasciae of both wings slightly darker than ground colour. Ground colour of underside of both wings as for thorax ; anterior part of subterminal very weakly marked, sometimes only represented by single spot between R_5 and M_1.

FEMALE. 38·2, 34·2–42·2 mm. (12). As for male but with following differences. Antennae minutely bipectinate, as for *albonotata*. Outer margin of fore wing slightly convex, not straight. Ground colour of both wings usually paler, O–14–7°, so that all markings are more prominent. Underside also paler, OOY–17–10° ; sometimes without trace of subterminal.

GENITALIA : MALE (Text-figs. 54, 55, 56). Saccus moderately long, slightly tapered. Valve long, broad, laterally flattened ; inner surface concave (similar to *examplata*) ; ventral margin dilated apicad, irregularly carinate. Anellus forms narrow band on each side of base of aedeagus ; these unite posteriorly, dorsal to aedeagus, forming anteroposteriorly flattened structure. Gnathus similar to *albonotata*, medial part tuberculate anteriorly. Socius short. Uncus with sharply

pointed posterior shoulders ; medially bifurcate, each arm downcurved, carinate and slightly dilated ventrally from base to two-thirds of its length. Aedeagus with inner and outer cornutus, inner only half length of outer ; vesica minutely spinose. Eighth sternite deeply emarginate posteriorly. Eighth tergite just wider transversly at its base than least width of eighth sternite, slightly tapered posteriorly, about twice as long as its greatest width ; apodemes from one-quarter to one-third width of anterior margin of tergite.

FEMALE. (Text-figs. 57, 58). Posterior margin of preostial sternite with minutely spinose patch and sclerotized plate on either side of medial line. Bursa copulatrix, spermatheca and corresponding ducts as for *albonotata*. Ostium without operculum. Ostial segment heavily sclerotized anteriorly ; produced dorsally over base of ovipositor lobes. Anterior apophyses minute or absent. Posterior apophyses very strongly developed. Ventral ovipositor lobes large. Dorsal ovipositor lobes small.

DIAGNOSIS. The dark brown colour of the male and the paler brown of the female readily distinguish the species from *albonotata*.

DISCUSSION. As noted previously, this species is placed in the superspecies *albonotata*.

DISTRIBUTION (Text-fig. 155). Distributed throughout New Guinea, extending to Goodenough Is. and Sudest Is. in the south-west.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 1 ♂, Dutch New Guinea, Central Arfak Mts., Ninay Valley, 3,500 ft., Feb. and March '09 (labelled " type ♂ " by Warren, but not mentioned in original description) ; 1 ♀, Fak-Fak, 1,700 ft., Dec. '07, Pratt ; 2 ♂, B. New Guinea, Dinawa, 4,000 ft. Sept. 1902, Coll. A. E. Pratt ; 3 ♀, Hydrographer Mts., 2,500 ft., Jan., Feb., March, 1918, Eichhorn Bros. ; 1 ♀, Collingwood Bay, Haidana, April 1907, A. S. Meek ; 1 ♀, Goodeough Isl., 2,500–4,000 ft., May 1913, (syntype ♀ of *semirufa* ab. *olivacea* Warren) ; 1 ♂, Goodenough Isl., 2,500–4,000 ft., A. S. Meek ; 1 ♂, 5 ♀, Sudest Isl., Mt. Riu, 2,000 ft., March, April 1916, Eichhorn Bros.

Tridrepana obscura sp. n.

TYPE. Holotype male (E. Java) Tennger, Singolangoe, 5,000 ft., May 1934, F. P. A. Kalis ; Drepanidae genitalia slide no. 179.

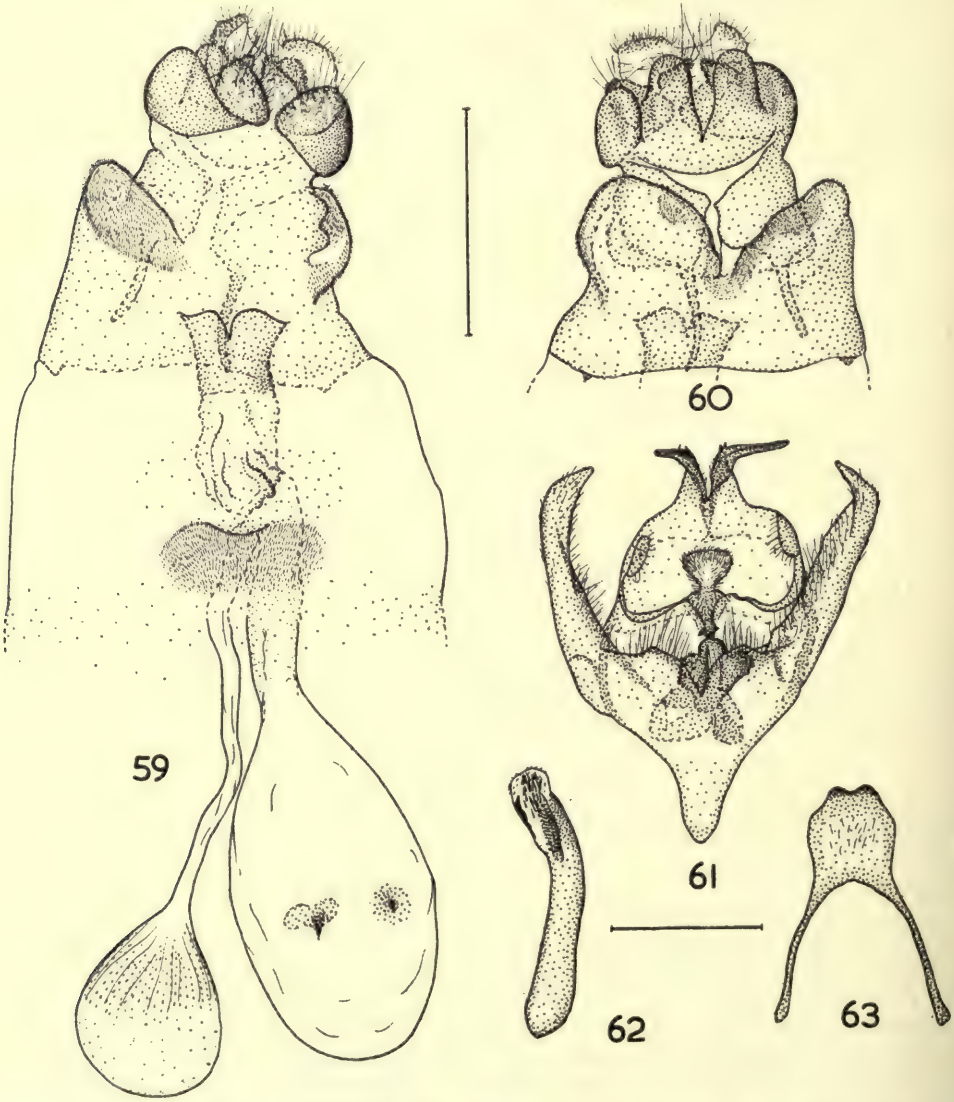
DESCRIPTION : MALE (Pl. 2, fig. 9). 29·8, 26·2–33·7 mm. (17). Head and thorax as for *albonotata angusta*.

Wings as for *albonotata angusta* but with following differences. Fore wing more strongly falcate apically (as in *albo. ferrea*). Discocellular and posterodistal spot of upperside smaller, former sometimes without white centre ; medial shade more strongly marked distal to postmedial ; markings of anterior part of subterminal less greatly enlarged and only faintly edged distally with whitish scales. Hind wing with posterodistal spot and postmedial diffusely marked. Both wings less distinctly lustrous. Underside with anterior part of subterminal faintly marked, sometimes represented by a single spot between M_1 and M_2.

FEMALE. 35·0, 34·0–36·4 mm. (5). As for male but with following differences,

Longest antennal pectination equal in length to one-half greatest diameter of eye (in contrast with *albonotata* female). Outer margin of fore wing slightly convex, not straight.

In five males and one female the ground colour of the upperside of both wings and the colour of the thorax and the abdomen is pale brown, OOS–16–7°.



FIGS. 59 and 60. *Tridrepana obscura* sp. n., allotype female. 59. Ventral view. 60. Dorsal view.

FIGS. 61–63. *T. obscura* sp. n., holotype male. 61. Genitalia. 62. Aedeagus. 63. Eighth sternite.

GENITALIA. Male. (Text-figs. 61, 62, 63). Saccus moderately long, tapered. Valve long, pointed; strong longitudinal carina on inner surface from base to near apex; apex falcate and hood-like. Anellus forming almost complete ring round base of aedeagus, divided ventromedially; produced dorsally on either side of medial line as broad band which curves anteriorly then posteriorly fusing with opposite band to form large, heavily sclerotized structure, evaginate laterally and posteriorly, invaginate medially; closely apposed to gnathus. Gnathus similar to *albonotata*; anterior part of medial structure sagittate, evaginate only at base; posterior flap small; lateral arms slender. Socius very short and broad. Uncus bifurcate medially into pair of tapered, divergent, downcurved arms; each arm with basoventral ridge and few short spines basodorsally. Aedeagus arcuate, most strongly so near apex; with inner and outer cornutus; vesica spinose. Eighth sternite longer than its greatest transverse width, weakly bilobed posteriorly. Length of anterior margin of eighth tergite one and a half times greatest width of eighth sternite; sharply constricted just before posterior margin which is less than one-third length of anterior margin; apodemes about one-third length of anterior margin.

FEMALE (Text-figs. 59, 60). Minutely spinose patch with rounded sclerotized plate immediately posterior to it placed medially at posterior margin of preostial sternite. Signa of bursa copulatrix similar to *albonotata*; ductus bursae minutely scobinate anteriorly, more lightly scobinate and slightly rimose posterior to junction with spermathecal duct, heavily sclerotized towards ostium. Spermatheca with radial ornamentation. Ostium with broad bilobed anterior lip forming partial operculum. Ostial segment well developed; posterior margin emarginate dorsally. Anterior apophyses very short. Intersegmental membrane (?) between ostial and preostial segment evaginate laterally and dorsally, covered with minute hair-like spines. Posterior apophyses long. Ventral ovipositor lobes strongly sclerotized and greatly dilated basally, papillate and hairy apically. Dorsal ovipositor lobes represented by pair of heavily sclerotized digitate lobes, and pair of hairy papillate lobes immediately ventral to latter.

DIAGNOSIS. The species can usually be distinguished from *albonotata* by the smaller cell spots, differently marked medial shade and less distinctly marked subterminal on the upperside of the fore wing in both sexes. Easily distinguished in the female by the more strongly pectinate antennae.

GENITALIA: MALE. The shape of the anellus and uncus separate the species from the rest of the species group.

FEMALE. Distinguished from *microcrocea* by the shape of the signa and the ostial segment; very different from *albonotata*.

DISCUSSION. The species apparently occurs in two forms, a yellow form and a pale brown form. (see above).

DISTRIBUTION. Java, Bali. 1 ♂ (in Brit. Mus.) from S.E. Sumatra, Liwa, is probably subspecifically different from the material mentioned below.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): allotype ♂, E. Java, Djoenngo Ardjoeno, 4,500 ft., May 1934, J. P. A. Kalis, Drepanidae genitalia slide no. 366; 1 ♀, 7 ♂ paratypes, from type locality, May, June 1934, J. P. A. Kalis; 1 ♀, 4 ♂ paratypes, 3 ♂, Djoenngo Ardjoeno, 4,500 ft., May, June, 1934, J. P. A.

Kalis; 1 ♂ paratype, Kletak Tengger, 6,000 ft., June 1934, J. P. A. Kalis; 2 ♀ paratypes, Nongkodjadjar, 4,000 ft., January, April 1934, A. M. R. Wegner; 2 ♂ paratypes, W. Bali, Mondoktoempang, 2,500 ft., October 1934, J. P. A. Kalis.

Tridrepana microcrocea Gaede

Tridrepana microcrocea Gaede, 1933, *Bull. Mus. Hist. nat. Belg.* **9**, No. 43 : 2.

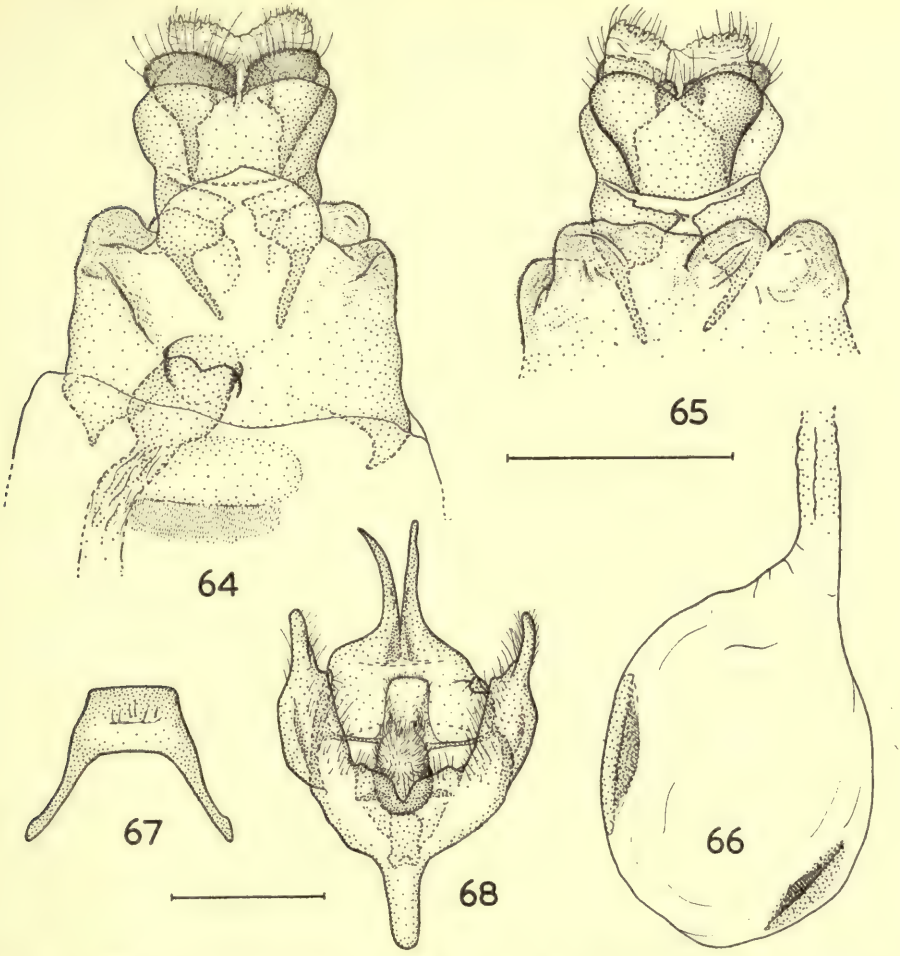
TYPE. Holotype male, Malacca, Tengah-Gebirge; Drepanidae genitalia slide no. 221 (in Zoologisches Museum der Humboldt Universität, Berlin).

DESCRIPTION: MALE. 27·4, 26·0–29·2 mm. (5). As for *albonotata angusta* but with following differences. R_1 from one-half areole, or more distally. Upperside of thorax and abdomen and ground colour of upperside of both wings OY–18/19–12°; fore wing with distance between posterodistal spot and postmedial (measured along M_3) equal to width of medial shade distal to postmedial at that point; medial shade not developed proximally except for small area distal to end of cell and near costa: posterodistal spot of hind wing more strongly marked, elongate, its longitudina-axis parallel to inner margin of wing; latter spot sometimes touching disco-cellular spot proximally. Base of cell on underside with small patch of long, curved, dark scales (possibly sensory).

FEMALE (Pl. 2, fig. 10). 34·1, 33·4–34·6 mm., (3). As for male but with following differences. Longest antennal pectination just shorter than greatest diameter of eye (ct. *albonotata*). Outer margin slightly convex, not straight. Upperside of both wings lighter, OY–19–12°, and more lustrous; markings also lighter in colour. Trace of marginal shade on underside of fore wing; sensory (?) patch absent.

GENITALIA: MALE (Text-figs. 67, 68). Saccus long, digitate. Valve moderately long, very slightly arcuate, digitate distally. Anellus developed lateral to base of aedeagus as small lobe; dorsal wall of each lobe produced anterodorsally as flattened plate, fusing with plate from other side medially; resultant medial plate produced anteriorly for short distance then bilobed and sharply reflexed posteriorly. Medial part of gnathus similar in structure to *albonotata*; free posterior part lightly covered with minute, hair-like spines; anterior evagination with long, hair-like spines at base. Socius minute. Uncus bifurcate posteriorly into pair of long, tapered, proximoventrally carinate processes. Aedeagus with outer and inner cornutus, outer cornutus very slender; vesica armoured with short spines. Eighth sternite truncate posteriorly. Eighth tergite twice as wide transversely at its base as least width of eighth sternite; tapered posteriorly, most strongly near posterior margin; length of posterior margin one-quarter to one-third length of anterior margin.

FEMALE (Text-figs. 64, 65, 66) Posteromedial margin of preostial segment with minutely spinose, elongate patch; rounded sclerotised plate immediately posterior to latter. Bursa copulatrix, spermatheca, and respective ducts as for *obscura* but with more elongate signa and posterior part of ductus bursae narrower. Ostium with bilobed anterior lip forming partial operculum. Ostial segment well developed. Intersegmental membrane (?) between ostial and preostial segment variously folded laterally and dorsally, covered with minute hair-like spines. Ventral ovipositor lobes well developed, papillate and hairy distally. Dorsal lobes united medially



FIGS. 64–66. *Tridrepana microcrocea* Gaede, female. 64. Ventral view of ovipositor lobes and ostium. 65. Dorsal view of ovipositor lobes. 66. Bursa copulatrix.

FIGS. 67 and 68. *T. microcrocea* Gaede, holotype male. 67. Eighth sternite. 68. Genitalia.

forming heavily sclerotized, posteriorly bilobed, hood-like structure ; produced into pair of small hairy lobes ventrally.

DIAGNOSIS. Distinguished from the rest of the species group by the dark patch of scales at the base of the cell on the underside of the fore wing in the male, and by the elongate posterodistal cell spot on the upperside of the hind wing in both sexes.

DISCUSSION. A similarly placed sensory (?) patch of scales occurs on the fore wing of the males of the next species group.

DISTRIBUTION. Malaya, Sumatra, Borneo.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 7 ♂, Malaya, Kuala Lumpur, Apr. 13.1926, Nov. 30, 1929, Jan.18, Feb.7, 17 1931, Jan.10, Dec.3 1932,

H. M. Pendlebury; 1 ♀, Perak, Taiping, E. Seimund; 1 ♀, Selangor-Pahang, Gintin Sempak, 29.v.1927; 2 ♂, 2 ♀, Singapore, H. N. Ridley; 1 ♂, S.E. Borneo, Samarinda, x.1938, M. E. Walsh; 1 ♀, B. N. Borneo, Kretam, 22.vi.1950, 8 p.m., J. D. H. Hedley. LANDBOUWHOGESCHOOL TE WAGENINGEN: 1 ♂, O. Borneo, 17 Nov. 1936, Qu. de Quarles; 1 ♂, Sum. O.K., Dolok Ilir, 26 May 1936.

Tridrepana sera (Warren)

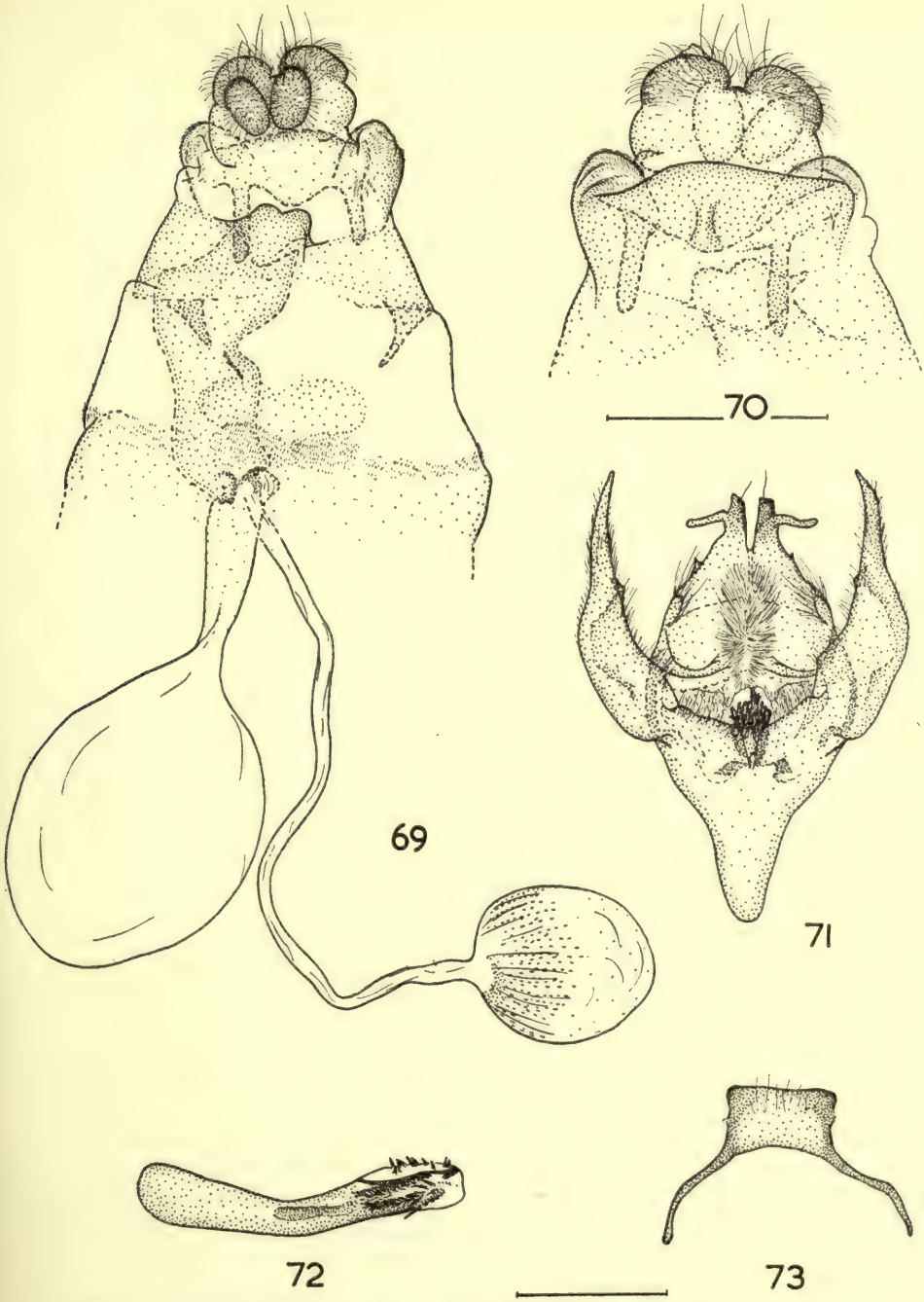
Drepana sera Warren, 1896, *Novit. zool.* **3**: 272.
Iridrepana sera (Warren), Warren, 1922, *Gross-Schmetterl.* **10**: 465.
Tridrepana sera (Warren), Gaede, 1931, *Lepid. Cat.* **49**: 30.
Iridrepana sera ab. *suffusa* (Warren), 1922, *Gross-Schmetterl.* **10**: 465 (SYN. NOV.).
Tridrepana sera ab. *suffusa* (Warren), Gaede, 1931, *Lepid. Cat.* **49**: 30.

TYPE. Holotype female, Fergusson I., xi.95, A. S. Meek; Drepanidae genitalia slide no. 188.

DESCRIPTION: MALE (Pl. 2, fig. 11). 29·5, 27·0–31·6 mm. (6). As for *albonotata angusta* but with following differences. Outer margin of fore wing slightly convex; R_1 usually from one-half areole. Upperside of fore wing with antemedial uninterrupted at veins; cell spots smaller; postmedial from two-fifths costa, lunulate from M_1 to M_2, nearly straight from M_2 to one-half inner margin; medial shade very faintly developed proximal to anterior part of postmedial, well marked distal to postmedial especially along its distal border; subterminal with single enlarged spot between M_1 and M_2, faintly edged with whitish scales. Hind wing with anterior part of antemedial more strongly marked; posterodistal spot smaller, trace of white centre; proximal line of postmedial from one-half inner margin, passing closer to end of cell than in *albonotata*; markings of distal postmedial line large, diffuse, each marking placed mid-way between corresponding markings of subterminal and proximal postmedial line, or closer to subterminal. Both wings less distinctly lustrous. Underside of fore wing with trace of marginal shade immediately inside outer margin of wing; subterminal represented by single spot between M_1 and M_2.

FEMALE. 35·0, 33·6–36·8 mm. (7). As for male but with following differences. Longest antennal pectination just over half greatest diameter of eye. Outer margin of fore wing more strongly convex; upperside of both wings slightly lighter in colour and more distinctly lustrous.

GENITALIA. MALE. (Text-figs. 71, 72, 73). Saccus moderately long, tapered. Valve long, tapered, slightly arcuate; proximal two-thirds hood-like. Anellus forming almost complete ring round base of aedeagus; each side produced posteriorly dorsal to aedeagus, uniting with opposite side to form strongly evaginate structure covered with long, stout, curved spines; continued posteriorly as narrow medial band, closely apposed to similar band from anterior margin of gnathus. Medial part of gnathus covered with long, hair-like spines; lateral arms well developed; membrane immediately anterior to anterior border of gnathus folded, forming small lobe on either side of medial line. Socius small. Uncus bifurcate medially, each resultant process with single apical hair and digitate ventral arm;



FIGS. 69 and 70. *Tridrepana sera* (Warren), female. 69. Ventral view of genitalia. 70. Dorsal view.

FIGS. 71–73. *T. sera* (Warren), holotype male. 71. Genitalia. 72. Aedeagus. 73. Eighth sternite.

carinate laterally, with one or two pointed teeth near middle of each lateral margin. Aedeagus geniculate just distal to mid-point; inner cornutus weakly developed, outer cornutus long; vesica armoured with spines of various lengths. Eighth sternite truncate posteriorly. Eighth tergite about two and a half times as long as length of anterior margin, equal in width anteriorly to length of posterior margin of eighth sternite; evenly tapered from anterior margin to near posterior margin; posterior margin slightly concave medially, equal in length to less than half length of anterior margin.

FEMALE. (Text-figs. 69, 70). Posteromedial margin of preostial sternite with rectangular, minutely spinose patch and rounded sclerotized plate immediately posterior to latter. Bursa copulatrix without signa; ductus bursae scobinate, flattened and strongly sclerotized posterior to junction with spermathecal duct, bent to left just anterior to ostium. Spermatheca with radial ornamentation. Ostium with bilobed anterior lip forming operculum. Ostial segment well developed, produced over base of ovipositor lobes dorsally. Intersegmental membrane (?) between ostial and preostial segment folded laterally, covered with small hair-like spines. Ventral ovipositor lobes globular, densely hairy; dorsal lobes fused basally, papillate and hairy posteriorly.

DIAGNOSIS. Distinguished from the rest of the species group by the nearly straight posterior half of the postmedial on the upperside of the fore wing.

DISTRIBUTION. Ferguson I., New Guinea.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 2 ♀, N.E. British New Guinea, Kumusi R., low level, June, July '07, A. S. Meek; 2 ♀, Milne Bay, Oct., xii.98, A. S. Meek; 1 ♀, Mafulu, 4,000 ft., xii.1933, L. E. Cheesman; Dinawa, 4,000 ft., Sept. 1902, Coll. A. E. Pratt; 2 ♂, Dutch New Guinea, Humboldt Bay Distr., Wembl., 30.vii, 8.viii.1937; 2♂, Snow Mts., nr. Oetakwa, up to 3,500 ft., x–xii.1910, Meek (including syntype of ab. *suffusa*); 1 ♂, Fak Fak, 1,700 ft., Jan-Feb. '08, Pratt; 1 ♂, 1 ♀, Central Arfak Mts., Ninay Valley, 3,500 ft., Nov.'08 to Jan.'09 and Feb.-March '09 (including syntype of ab. *suffusa*).

Species group *crocea* Leech

Although the colour pattern of the group is similar to that of the previous group, it is readily distinguished from it by the presence of three medial spots on the upperside of the fore wing in both sexes, and a dark patch of thickened (sensory?) scales at the base of the cell on the underside of the fore wing in the male. In the male the gnathus is produced anteriorly as a long narrow band, the socii are well developed and the uncus is bifurcate into a pair of unbranched arms.

The species *crocea* Leech and *unispina* sp. n. would undoubtedly have been treated as races of one species had it not been for the fact that they are sympatric in part of their ranges, apparently without interbreeding. *T. septempunctata* Warren is polytypic.

Tridrepana crocea (Leech) (comb. nov.)

Drepana crocea Leech, 1888, *Proc. zool. Soc. Lond.* **1888**: 649 (fig.).
Albara crocea (Leech), Kirby, 1892, *Syn. Cat. Lep. Het.* p. 734.
Drepana crocea Leech, Strand, 1911, *Gross-Schmetterl.* **2**: 201.

Konjikia crocea (Leech), Nagano, 1917, *Bull. Nawa ent. Lab.* **2** : 39.
Drepana crocea Leech, Gaede, 1931, *Lepid Cat.* **49** : 26.

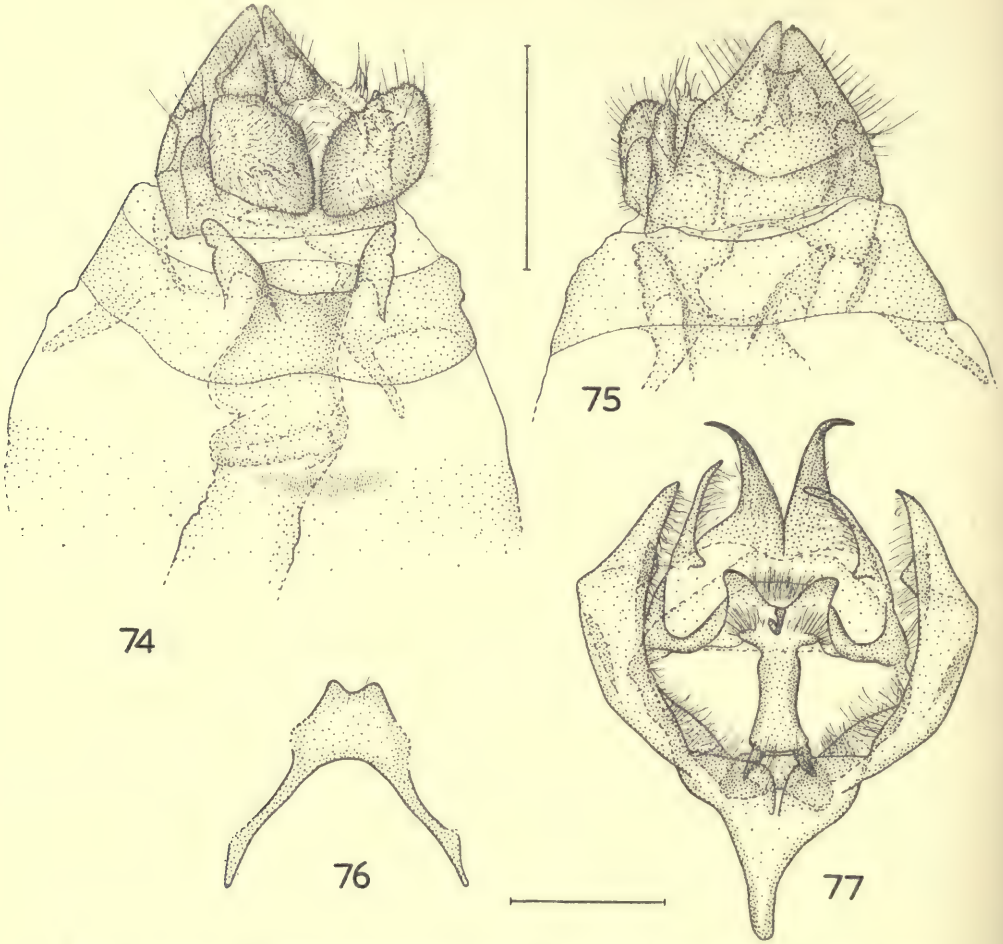
TYPE. Holotype female, Japan, H. Pryer Coll.; Drepanidae genitalia slide no. 372 (described as male, in error).

DESCRIPTION : MALE (Pl. 2, fig. 12). 37·4, 30·4–42·6 mm. (78). As for *albonotata angusta* but with following differences. Outer margin of fore wing usually slightly convex ; ground colour of upperside OOY–17/18–12°, all markings slightly darker ; mid-cell spot present ; medial shade O–14–11°, part distal to postmedial rather broader than in *albonotata* ; postmedial indented inwards immediately anterior to cell ; anterior subterminal markings more conspicuously edged distally and laterally with whitish scales ; marginal shade not extending posterior to M_3. Hind wing with white streak along base of Cu_1 at end of cell, as in *albo celebesensis* ; distal postmedial line only developed posteriorly, diffusely marked. Both wings lustrous except for small patches proximal to markings of subterminal, all area distal to it, and dark centres of anterior subterminal markings in fore wing, and in area distal to subterminal in hind wing. Underside OOY–18–11°. Fore wing with anterior part of distal postmedial line, anterior part of subterminal, and discocellular spot moderately well marked ; trace of posterodistal spot ; patch of dark, thickened, rounded scales (possibly sensory) along and on either side of posterior border of cell from base to mid-way between base and Cu_2 ; greatest width of patch equal to half greatest diameter of eye, tapered distally. Proximal half of hind wing with numerous elongate raised scales forming whorl at humeral angle.

FEMALE. 44·4, 41·4–52·2 mm. (13). As for male but with following differences. Antenna minutely bipectinate, longest pectination about twice diameter of shaft at that point. Outer margin of fore wing usually more strongly convex. Upperside of both wings sometimes more weakly coloured ; more distinctly lustrous. Without (sensory ?) patch on underside of hind wing.

GENITALIA : MALE (Text-figs. 76, 77). Saccus moderately long, tapered. Valve arcuate, pointed and slightly falcate at apex. Anellus produced anterodorsally dorsal to base of aedeagus, then bent dorsally through nearly 360°, forming short, slightly tapered plate closely apposed to anterior part of gnathus. Gnathus with pair of stout, dorsoventrally flattened lobes medially, with short slender process between them ; produced anteriorly, terminating in pair of stout, spiny, conical processes ; short sub-anal flap ; lateral arms strongly developed, arcuate. Socius long, slender, with short process near base. Uncus bifurcate posteriorly into pair of sharply tapered, downcurved arms. Outer cornutus of aedeagus geniculate apicad, three-quarters length of inner cornutus ; vesica spinose, longest spine over half greatest width of inner cornutus. Eighth sternite weakly bilobed posteriorly. Eighth tergite quadrate, about one and a half times as long as its greatest transveres width ; greatest width one and a quarter times as wide as greatest width of eighth sternite ; apodemes usually two-thirds as long as least width of tergite.

FEMALE (Text-figs. 74, 75). Posteromedial margin of preostial sternite with small, minutely hairy patch. Bursa copulatrix with pair of elongate signa (shape as for *albonotata*). Ductus bursae minutely scobinate anteriorly, rugose and more lightly scobinate posterior to junction with spermathecal duct ; strongly sclerotized



FIGS. 74 and 75. *Tridrepana crocea* (Leech), holotype female. 74. Ventral view of ostium and ovipositor lobes. 75. Dorsal view.
FIGS. 76 and 77. *T. crocea* (Leech), male. 76. Eighth sternite. 77. Genitalia.

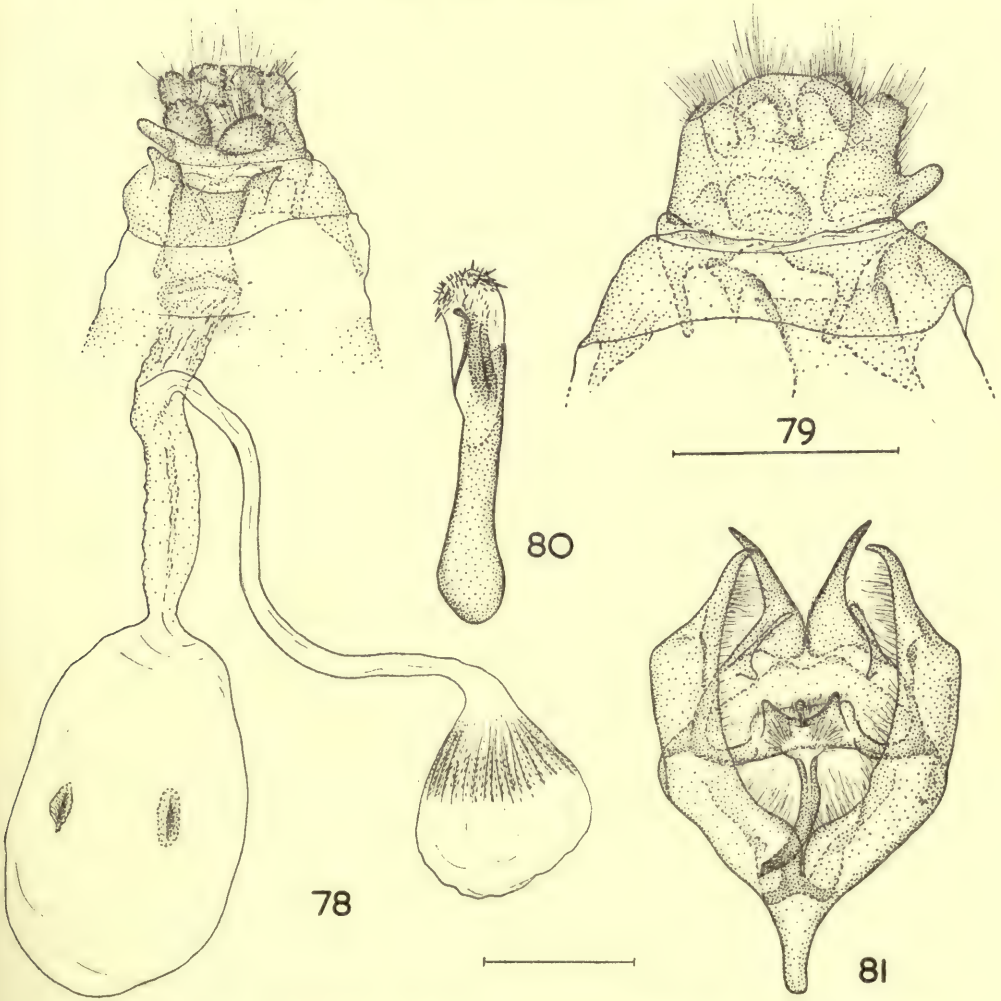
anteriorly. Ostium with flattened lobe on either side. Spermatheca radially ornamented, as for *fulvata*. Ventral ovipositor lobes papillate, densely hairy; dorsal lobes forming heavily sclerotized triangular structure. Pair of small irregularly shaped lobes one on either side of ventral lobes; further flattened, digitate lobe on either side immediately anterior to latter.

DIAGNOSIS. Most readily distinguished from the rest of the species group by the shape of gnathus in the male and the shape of the ovipositor lobes in the female.

DISCUSSION. Although this species is morphologically very close to *unispina*, it is sympatric with it in part of its range apparently without interbreeding, and must therefore be specifically distinct from it.

DISTRIBUTION (Text-fig. 155). Japan, and the following provinces of China: Chekiang, Fukien and Hunan.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂, Japan, Asam, 10.viii.96, Jones; 1 ♂, 1 ♀, Honshu Plains, prov. Musashi, Tokyo, 10, 12.x.1893, A. E. Wileman; 42 ♂, 1 ♀, Takao-San, W. of Tokyo, June, July, 1926, June 1925, M. Aigner; 1 ♂, Takao-San, 21 Sept. 1950, H. Inoue; 1 ♂, Nikko, October 1925, M. aigner; 11 ♂, 3 ♀, Honshu, prov. Yamato (Nara), Yoshino, vii.x.1899, vii, ix, x 1900, June 1901, A. E. Wileman; 3 ♂, Yoshima, August 1899, Aug., Oct. 1900, A. E. Wileman; 1 ♀, Hondo (Honshu) Kioto, x.1908, G. Kon; 2 ♂, 1 ♀, Japan. ZOOL. FORSCHUNGSINSTITUT U. MUS. A. KOENIG, BONN: 1 ♀, Jokohama, 25.x.11; H. Höne; 2 ♂, Yokohama, 1891; 1 ♀, Hakone am Fuji, Aug. 1916, H Höne; 9 ♂, 2 ♀, (China), Chekiang, West Tien-Mu-Shan, 1,600 m., 5, 7, 9, 10, 11.1932,



FIGS. 78 and 79. *Tridrepana unispina* sp. n., allotype female. 78. Ventral view of genitalia. 79. Dorsal view.

FIGS. 80 and 81. *T. unispina* sp. n., male. 80. Aedeagus. 81. Genitalia.

H. Höne ; 2 ♂, Chekiang, Ost Tien-Mu-Shan, 9.xi.32, 21.v.1931, H. Höne ; 2 ♂, Fukien, Kuatun, 2,300 m., 28.v.1938, L. J. Klapperish ; 3 ♂, Fukien, Kuatun, 7, 8, 9.38, H. Höne; 1 ♀, Sudchina, Amoy, 7.viii.24, H. Höne ; 2 ♂, Hunan, Hoeng-Shan 900 m., 4, 16.v.1933, H. Höne.

Tridrepana unispina sp. n.

pro parte *Drepana crocea* Leech, Strand, 1911, *Gross Schmetterl.* **2** : 201.
pro parte *Drepana crocea* Leech, Gaede, 1931, *Lepid. Cat.* **49** : 26.
Drepana crocea Leech, Strand, 1915, Arch. Naturgesch. **A12** : 163.

TYPE. Holotype male, Moupin (W. China, Szechwan), June 1890, Kricheldorff coll.; Drepanidae genitalia slide no. 183.

DESCRIPTION : MALE. 36·0, 31·6–42·0 mm.(7). As for *crocea*, but with (sensory ?) patch at the base of the cell on the underside of the fore wing narrower ; greatest width one-quarter to one-third diameter of eye.

FEMALE. 47.6, 47.2–48.0 mm. (2). As for ♀ *crocea*.

GENITALIA : MALE (Text-figs. 80, 81). Similar to *crocea*, differing chiefly in the shape of the anellus and gnathus ; eighth tergite relatively longer, about twice as long as its greatest transverse width.

FEMALE (Text-figs. 78, 79). Bursa copulatrix, spermatheca and associated ducts as for *crocea*. Ostial lobes similar to *crocea* but shorter. Shape of ovipositor lobes quite different from *crocea*.

DIAGNOSIS. Easily distinguished from *crocea* by the shape of the gnathus in the male genitalia and by the shape of the ovipositor lobes in the female.

DISCUSSION (see *crocea*).

DISTRIBUTION (Text-fig. 155). Formosa, and the following provinces of China : Fukien, Yunnan.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : allotype ♀, with same data as holotype. Drepanidae genitalia slide no. 374 ; 1 ♂, Formosa, Kansherei, 1,000 ft., 15.xi.1908, A. E. Wileman. ZOOL. FORSCHUNGSINSTITUT U. MUS. A. KOENIG, BONN : 2 ♂, Fukien, Kuatun, 2,300 m., 27.40 N, 117.40 E., 19.v.1946, J. Klapperich ; 1 ♂, 1 ♀, prov. Nord Yunnan, Li-kiang, 8.vi.23, 2.ix.1935, H. Höne. DEUTSCHES ENTOM. INSTITUT, BERLIN : 1 ♂, Formosa, Alikang, '09 ; 1 ♂, Formosa, v-vi.1912, H. Sauter.

Tridrepana septempunctata septempunctata Warren

Tridrepana septempunctata Warren, 1896, *Novit. zool.* **3** : 339.
Iridrepana septempunctata Warren, Warren, 1922, *Gross-Schmetterl.* **10** : 465.
Tridrepana septempunctata Warren, Gaede, 1931, *Lepid. Cat.* **49** : 30.
Drepana albonotata Moore, Hampson, 1897, *J. Bombay nat. Hist. Soc.* (2) **11** : 288.
Drepana albonotata var. *septempunctata* Warren, Dudgeon, 1899. *J. Bombay nat. Hist. Soc.* (4) **12** : 654.

TYPE. Holotype male, Khasis, Nov. 1895, Nat. Coll.; Drepanidae genitalia slide no. 185.

DESCRIPTION : MALE (Pl. 2, fig. 17). 32·3, 30·2.–34·6 mm. (3). As for *crocea* but with following differences. Fore wing more strongly falcate ; upperside with medial

shade darker, O–11–10°; enlarged anterior markings of subterminal, especially spot between M_1 and M_2, with broader whitish edge. Upperside of fore wing lustrous, except area immediately distal to medial shade and proximal to subterminal, area distal to subterminal posterior to M_3, and dark centres of anterior subterminal markings; hindwing with similar distribution of lustrous scales, but whole of area distal to subterminal lustrous. Underside of fore wing with (sensory ?) patch extending distally as far as base of Cu_2; marginal shade distal to anterior part of subterminal moderately well marked, O–8–12° to O–15–10°.

GENITALIA: MALE (Text-figs. 82, 83). Saccus moderately long, digitate. Valve evenly tapered; apical two-thirds slightly arcuate; bluntly pointed. Anellus produced posteriorly as short truncate plate, weakly bilobed at base; closely apposed to gnathus posteriorly. Gnathus with broad, hairy, medial pad forming short sub-anal flap posteriorly; produced anteriorly as narrow, dorsally arched band, terminating close to anellus in small conical process. Socius long, slender, with short process at base. Uncus bifurcate nearly to base posteriorly into pair of tapered, down-curved arms, distinctly dilated basad. Aedeagus as for *crocea* but with inner cornutus just under half length of aedeagus, and with no spine longer than half greatest width of inner cornutus. Eighth sternite about three times as long as broad, truncate posteriorly. Eighth tergite twice as long as its transverse width, as wide anteriorly as length of eighth sternite, slightly tapered anteriorly; apodemes about half as long as least width of tergite.

FEMALE. Not known.

DIAGNOSIS. Distinguished from *crocea* by the broader whitish edge to the anterior subterminal markings on the upperside of the fore wing. Readily separated from all species of the species group by the genitalia.

DISTRIBUTION. India, (Assam). A male from Tonkin (in Muséum National, Paris) is probably subspecifically distinct from this race.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂, from type locality, Oct.1895, Nat. Coll.; 1 ♂, Jainta Hills, Sundye.

Tridrepana septempunctata nitidior ssp. n.

TYPE. Holotype male, S.W. Sumatra, North Korintji Valley, 5,000 ft., Sept.–Oct. 1921, C.,F., and J. Pratt; Drepanidae genitalia slide no. 468.

DESCRIPTION: MALE. 34·8, 33·2–36·2 mm. (4). As for nominate race but with following differences. Upperside of fore wing with antemedial and postmedial darker in colour; proximal part of medial shade differently coloured due to absence of lustrous scales, O/OOS–10–10°. Hind wing with antemedial and postmedial darker in colour. Lustrous scaling of upperside of fore wing confined to area extending from immediately proximal to postmedial to immediately distal to subterminal, excluding dark centres of anterior subterminal markings. In hind wing, whole of area from base of wing to immediately distal to subterminal lustrous, most distinctly so distally. (Sensory ?) patch on underside of fore wing narrower, of uniform width, extending distally to Cu_1.

GENITALIA: MALE (Text-figs. 87, 88). As for nominate race but with following

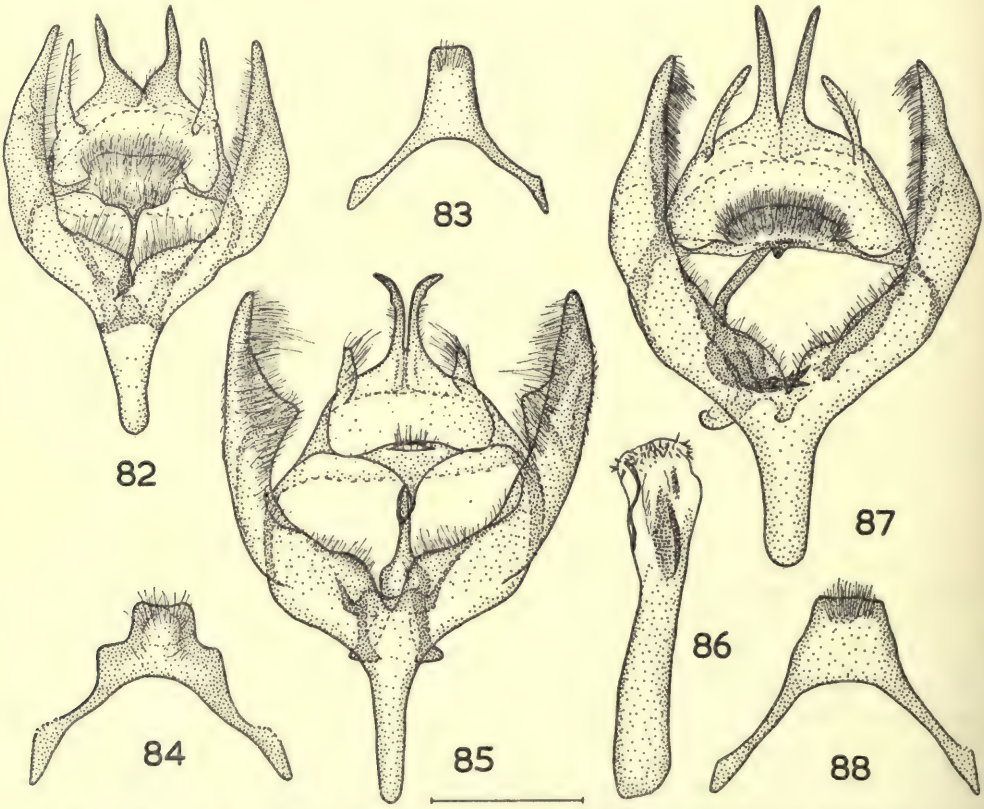
differences. Ventral margin of valve with basal bulges less well developed. Anterolateral lobes near base of anellus much larger; posterior process slightly constricted at base. Medial hairy part of gnathus crescentic; anterior part longer than in nominate race, more distinctly expanded apicad and terminating in large spinose process. Socius without basal process. Base of uncus not dilated. Eighth sternite just longer than its least transverse width.

FEMALE. Not known.

DIAGNOSIS. Easily distinguished from the nominate race by the different distribution of lustrous scales.

DISTRIBUTION. S.W. Sumatra.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 2 ♂ paratypes, with same data as holotype; 1 ♂ paratype, S.W. Sumatra, Barisan Range, Western Slopes, 2,500 ft., Oct.–Nov. 1921, C., F., and J. Pratt.



FIGS. 82 and 83. *Tridrepana septempunctata septempunctata* Warren, holotype male. 82. Genitalia. 83. Eighth sternite.

FIGS. 84–86. *T. subtusmaculata* Gaede, male. 84. Eighth sternite. 85. Genitalia. 86. Aedeagus.

FIGS. 87 and 88. *T. s. nitidior* ssp. n., holotype male. 87. Genitalia. 88. Eighth sternite.

Tridrepana subtusmaculata Gaede (stat. nov.)

Tridrepana septempunctata f. *subtusmaculata* Gaede, 1933, *Bull. Mus. Hist. nat. Belg.* **9**, No. 43 : 2.

TYPE. Holotype male, Malacca, Pahang, 10.xi.1932, Coll. Prince Leopold Voyage Indes (at Institut Royal des Sciences Naturelles de Belgique).

DESCRIPTION : MALE. (Pl. 2, fig. 15). 34·1, 31·4–36·8 mm. (4). Outer surface of palp, antenna, and head between and posterior to antennae OOS–9–12° ; head anterior to antennae OOS–6–12°, to OOS–9–12° above labrum ; longest antennal pectination about one and a quarter times greatest diameter of eye.

Thorax with narrow whitish anterior border, rest of thorax and abdomen OOS–9/10–12° above, OOY–19–10° below. Fore wing very strongly falcate, outer margin slightly convex ; venation as for *crocea*. Upperside of both wings with medial fasciae and spots as for *crocea*, but whitish discocellular spot on fore wing smaller and distal postmedial line on hind wing concealed by medial shade. Medial shade of fore wing strongly marked, extending from base of wing to short distance distal to postmedial ; OOS–9/10–12° proximal to postmedial, lustrous and lighter distal to postmedial, OOS–12–11° ; distal border of shade nearly straight (cf. *crocea*). Subterminal as for *crocea* posterior to M_2 ; lunulate between R_4 and M_2, markings proximally convex ; edged distally and proximally with whitish scales between R_5 and M_3, especially distal to M_1–M_2 marking ; streak of greyish white scales extending from immediately proximal to R_4–R_5 marking to apex of wing. Marginal shade between anterior part of subterminal and outer margin OOS–12–7° to OOS–4–8°, most strongly marked apically and immediately distal to subterminal markings. Rest of wing OOY–19–12°. Upperside of hind wing OOY–19–9° anteriorly, ground colour of rest of wing OOY–17–12°. Medial shade as for fore wing but slightly lighter due to lustrous scales ; subterminal as for *crocea*. Costal area of fore wing and area distal to postmedial lustrous, except for narrow band proximal to subterminal, and anterior markings of subterminal : in hind wing, area extending from just distal to distal border of medial shade to base of wing lustrous, most distinctly so distally ; markings of subterminal also lustrous. Underside of fore wing OOY–17–11° anterior to cell, OOY–18–10° posterior to cell ; cell and area between it and subterminal O–12–3° ; anterior part of distal postmedial line strongly marked ; subterminal represented by large, ovate, whitish spot between M_1 and M_2, and sometimes by similar but much smaller spot between R_5 and M_1, and between M_2 and M_3 ; subterminal markings edged with O–5–9° ; marginal shade similarly coloured ; (sensory ?) patch at base of cell as for *crocea* but narrower, greatest width equal to one third greatest diameter of eye. Underside of hind wing OOY–18–10°, medial shade sometimes showing through faintly. Underside of both wings sublustrous.

GENITALIA : MALE (Text-figs. 84, 85, 86). Saccus long, digitate. Valve slightly arcuate, very bluntly pointed. Anellus produced anteriorly on either side of medial line then curved dorsally through nearly 360°, sides uniting medially to form dorsoventrally flattened plate, sharply tapered and continued posteriorly as narrow band to meet anterior part of gnathus to which it is closely apposed. Gnathus with small hairy subanal flap, and broad triangular medial plate which is sharply tapered

anteriorly, reflexed dorsally then looped forwards again to meet anellus; lateral arms slender. Socius short, about four times as long as its greatest diameter; without basal process. Uncus bifurcate nearly to base into pair of slender, downcurved arms, weakly dilated dorsobasally. Aedeagus with inner and outer cornutus; vesica spinose, longest spine just longer than greatest width of outer cornutus. Shape of eighth sternite distinctive (see figure). Eighth tergite not as long as its greatest transverse width, nearly twice as wide anteriorly as greatest width of eighth sternite, tapered posteriorly; posterior margin about half length of anterior margin.

FEMALE. Not known.

DIAGNOSIS. Distinguished from the rest of the species group by the more strongly falcate fore wing, and the presence of a medial shade on the hind wing.

DISTRIBUTION. Malaya, S.E. Borneo.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂ F.M.S., Perak, Larut Hills, 3,700 ft., 11.Feb. 1932, H. M. Pendlebury; 1 ♂, S.E. Borneo, Samarinda, ix.1938, M. E. Walsh.

Species group ***olivacea*** Warren

This group contains four species. All except *obliquitaenia* Warren closely resemble *fulvata* Snellen in colouration, but are distinguished from it by the possession of only three medial spots, and by the larger size: apart from the former species there are only small interspecific differences. The male genitalia is quite distinctive (Text-figs. 92–103).

olivacea Warren is polytypic: the New Guinea race is dimorphic, there is a yellow form and and a brown form.

Tridrepana examplata Warren

Iridrepana examplata Warren, 1922, *Gross-Schmetterl.* **10**: 465.
Tridrepana examplata Warren, Gaede, 1932, *Lepid Cat.* **49**: 29.

TYPE. I select the following specimen as lectotype. Lectotype male, Central Dutch New Guinea, Mt. Goliath, about 139° long., 5–7,000 ft., January 1911, A. S. Meek; Drepanidae genitalia slide no. 356.

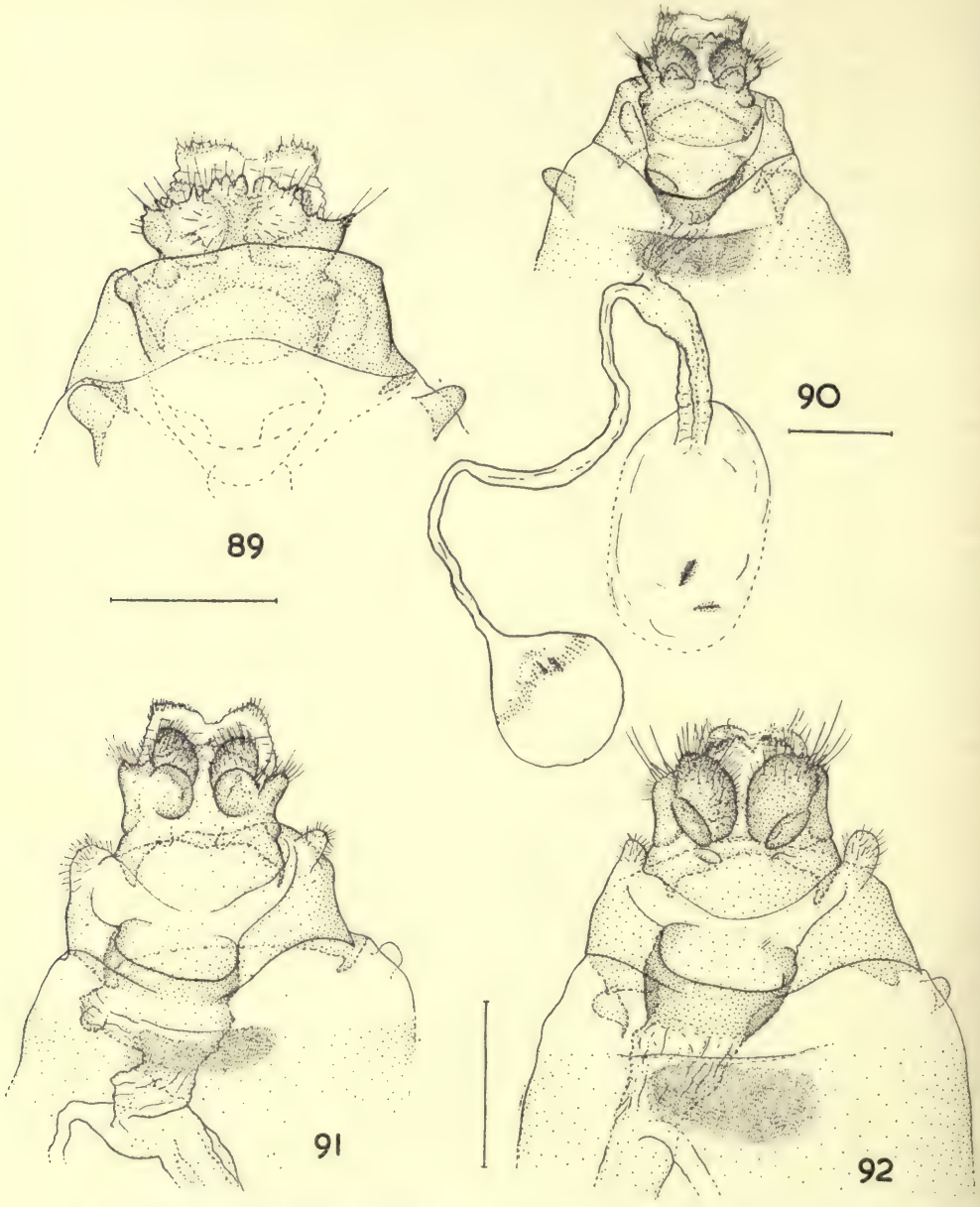
DESCRIPTION: MALE (Pl. 2, fig. 14). 42·4, 38·0–46·2 mm. (79). Outer surface of palp, antennae, and head between and posterior to antennae OOY–16/17–11°; head OOS–10–12° anterior to antennae, to OOY–16/17–11° above labrum; longest antennal pectination equal to one and a half times greatest diameter of eye.

Thorax with narrow whitish anterior border, rest of thorax and abdomen OOY–17–10° above, OOY–19–11° beneath. Fore wing strongly falcate; outer margin straight except at apex; venation as for *fulvata*, but R_1 usually from one-third areole and R_3, R_4 and R_5 sometimes shortly stalked. Ground colour of upperside of fore and hind wing OOY–17/18–12°. Antemedial of fore wing from one-sixth costa to one-third inner margin; postmedial simple, from just over two-thirds costa to two-thirds inner margin, strongly lunulate between M_3 and Cu_2; both medial fasciae OOS/O–6–7°; broad, oblique, medial shade between medial fasciae except for base of cell and small patches immediately proximal to postmedial markings

between M_3 and Cu_2, extending distal to postmedial anteriorly, reaching apex along costa, OOS/O–11–5° ; whitish mid-cell spot edged with OOS/O–6–7° ; similar but smaller discocellular spot, also edged with darker scales ; posterodistal spot as for mid-cell spot but with surrounding dark area usually extending posteriorly to Cu_2 ; subterminal O–1–8°, expanded into rounded spots between M_1 and M_3, markings between apex and M_3 edged distally with whitish scales, fascia continued posteriorly as short interneural dashes ; marginal shade between anterior part of subterminal and outer margin from apex to mid-way between M_3 and Cu_1, OOS/O–6–7° ; fringe bordering marginal shade slightly darker. All scaling lustrous except for area extending from immediately distal to postmedial to outer margin posterior to M_3, and distal half of dark centres of anterior subterminal markings ; most distinctly lustrous near postmedial. Hind wing venation as for *fulvata* but Sc + R_1 usually anastomosing with Rs for short distance after end of cell. Colour of fasciae of upperside of hind wing as for fore wing ; trace of antemedial at base of cell, between Cu_2 and 2A and at inner margin ; small dark discocellular spot ; whitish posterodistal spot, additional whitish streak at base of Cu_1, both surrounded by area of OOS/O–11–5° ; further minute whitish streak usually present near base of Cu_2, also edged with darker scales ; postmedial simple, from one-third inner margin, dentate, diffusely marked posteriorly ; subterminal of short interneural dashes. Wing lustrous except for area extending from outer margin to immediately distal to postmedial, excluding markings of subterminal ; most distinctly lustrous near postmedial. Underside of both wings OOY–18–12°, except for fore wing proximal to postmedial (OOY–16/17–11°) ; fore wing with trace of mid-cell spot and posterodistal spot ; discocellular spot well marked ; anterior part of postmedial and subterminal well marked as interneural dashes ; distal part of marginal shade also present ; fringe bordering marginal shade as for upperside.

FEMALE (Pl. 2, fig. 16). 48·3, 41·2–51·0 mm. (7). As for male but with following differences. Longest antennal pectination two-thirds greatest diameter of eye. Outer margin of fore wing more strongly convex. Upperside of both wings usually slightly lighter in colour ; fore wing without medial shade, and with marginal shade between anterior part of subterminal and outer margin not extending posterior to M_3 ; underside of both wings also usually lighter than in male.

GENITALIA : MALE (Text-figs. 93, 94, 95). Saccus moderately long, tapered. Valve broad, laterally flattened, densely hairy ; inner surface concave. Anellus produced posteriorly as broad sclerotized band dorsal to base of aedeagus, then reflexed dorsally to form dorsoventrally flattened pouch-like invagination ; dorsal wall of pouch minutely spinose anteriorly, densely hairy posteriorly, and produced as far as gnathus. Gnathus with large, truncate, subanal flap medially, and convex, tapered, apically conical anterior part ; lateral arms stout. Socius very small. Uncus subquadrate : posterior shoulders slightly produced ; bifurcate medially and produced ventrolaterally on either side as tapered arm. Aedeagus with inner and outer cornutus ; vesica scobinate and minutely spinose. Eighth sternite variable in shape but usually as in figure. Eighth tergite twice as long as its least transverse width, greatest width about twice least width of eighth sternite, slightly tapered posteriorly ; posterolateral corners produced into short, pointed lobes.



FIGS. 89 and 90. *Tridrepana exemplata* Warren, female. 89. Dorsal view. 90. Ventral view of genitalia.

FIG. 91. *T. olivacea olivacea* Warren, female, ventral view of ostium and ovipositor lobes.

FIG. 92. *T. o. crocata* ssp. n., allotype female, ventral view of ostium and ovipositor lobes.

FEMALE (Text-figs. 89, 90). Bursa copulatrix with two signa (shape as for *albonotata*). Ductus bursae minutely scobinate anterior to junction with spermathecal duct; posterior third not scobinate, strongly rimose. Spermatheca with radial ornamentation. Ostium with strongly developed anterior margin. Preostial sternite with minutely hairy, rectangular patch posteromedially; segment with short, rounded, membranous lobe on either side. Ostial segment with similar but smaller lobe ventrolaterally on either side. Anterior apophyses short. Ventral ovipositor lobes glabrous basally, papillate and hairy distally. Dorsal lobes weakly developed dorsally, each extending laterally to near lateral border of corresponding ventral lobe. Posterior apophyses short, strongly developed.

DIAGNOSIS. Distinguished in both sexes from *olivacea* (except for the brown form of the New Guinea race), by the more distinct lustrous areas on the upperside of both wings, especially near the postmedial of the fore wing.

GENITALIA. The shape of the anellus in the male separates the species from *olivacea*. In the female the absence of posterolateral hairy lobes on the ostial segment is similarly diagnostic.

DISCUSSION. It is interesting to compare the colour pattern of this species with that of another taxon from New Guinea, *lunulata fasciata*. In the latter, only a small percentage of the specimens of both sexes examined were of the banded form, i.e. having a dark medial shade on the upperside of the fore wing. A similar medial shade was present in all the male specimens of *examplata* examined, but absent in all the females.

DISTRIBUTION. Distributed throughout New Guinea.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST): syntype ♀, with same data as lectotype, Drepanidae genitalia slide no. 387; 10 ♂, 1 ♀, from type locality, Jan., Feb. 1911, A. S. Meek; 2 ♂, from type locality, Jan.–Feb. 1911: 32 ♂, Weyland Mts., Kunupi, Menoo Valley, 6,000 ft., Nov.–Dec. 1920, Dec. '20 to Jan. '21, C., F., and J. Pratt; 11 ♂, 1 ♀, Wandammen Mts., 3–4,000 ft., Nov.1914, A. C. and F. Pratt; 7 ♂, 1 ♀, Central Arfak Mts., Ninay Valley, 3,500 ft., Nov. '08 to Jan. '09, Feb. and March '09; 1 ♂, 1 ♀, Arfak Mts., Angi lakes, 6,000 ft., Jan.–Feb. 1911, March 1914, A. C. and F. Pratt; 1 ♂, Cyclops Mts., Sabron, Camp 2, 2,000 ft., vii.1936, L. E. Cheesman; 2 ♂, British New Guinea, Kratke Mts., Buntibasa distr., 4,000–5,000 ft., April, vii.1932, F. Shaw-Mayer; 3 ♂, 1 ♀, Angabunga R., affl. of St. Joseph R., 6,000 ft., upwards, Nov. 04–Febr. '05, A. S. Meek; 2 ♂, Dinawa, 4,000 ft., Sept. 1902, Coll. A. E. Pratt; 1 ♂, Hydrographer Mts., April 1918, Eichhorn Bros.; 16 ♂, Mambare R, Biagi, 5,000 ft., Jan., Feb., April '06, A. S. Meek. RIJKSMUSEUM VAN NATUURLIJKE HISTORIE: 3 ♂, 1 ♀, Nieuw Guinea Exp., K.N.A.G., Paniai, Araboebivac, ix, x.1939.

Tridrepana olivacea olivacea Warren

Iridrepana olivacea Warren, 1922, *Gross-Schmetterl.* **10**: 464.
Tridrepana fulvata ab. *olivacea* Warren, 1903, *Novit. zool.* **10**: 346.
Tridrepana fulvata ab. *olivacea* Warren, Gaede, 1931, *Lepid. Cat.* **49**: 29.
Iridrepana semirufa Warren, 1922, *Gross-Schmetterl.* **10**: 464 (SYN. NOV.).
Tridrepana semirufata Warren, Gaede, 1931, *Lepid. Cat.* **49**: 30.

Iridrepana semirufa elegans Warren, 1922, *Gross-Schmetterl.* **10** : 465. (SYN. NOV.).
Iridrepana semirufa ab. *diluta* Warren, 1922, *Gross-Schmetterl.* **10** : 465. (SYN. NOV.)
Tridrepana tristigma Warren, 1922, *Gross-Schmetterl.* **10** : 465 (SYN. NOV.).
Tridrepana tristigma Warren, Gaede, 1931, *Lepid Cat.* **49** : 31.

TYPE. I select the following specimen as lectotype. Lectotype male, Brit. N. G., Upp. Aroa R., March '03, Meek ; Drepanidae genitalia slide no. 170. (Brown form).

DESCRIPTION : MALE (yellow form). (Pl. 2, fig. 13). 37·8, 34·0–41·0 mm. (40). As for *examplata* but with following differences. Postmedial of upperside of fore wing less diffusely marked, markings between M_3 and Cu_1 more strongly lunulate and nearly pointed distally ; mid-cell spot smaller than discocellular spot, sometimes nearly obsolete (relative sizes of remaining spots as for *examplata*) ; posterior part of subterminal less distinctly marked ; marginal shade extending posteriorly to Cu_1 ; lustrous scaling less distinct, usually not extending to postmedial in middle of wing so that markings of postmedial between M_3 and Cu_1 enclose small non-lustrous areas proximally. Posterodistal spot on upperside of hind wing without additional streaks posteriorly ; subterminal less strongly marked. Underside of fore wing with no trace of mid-cell spot.

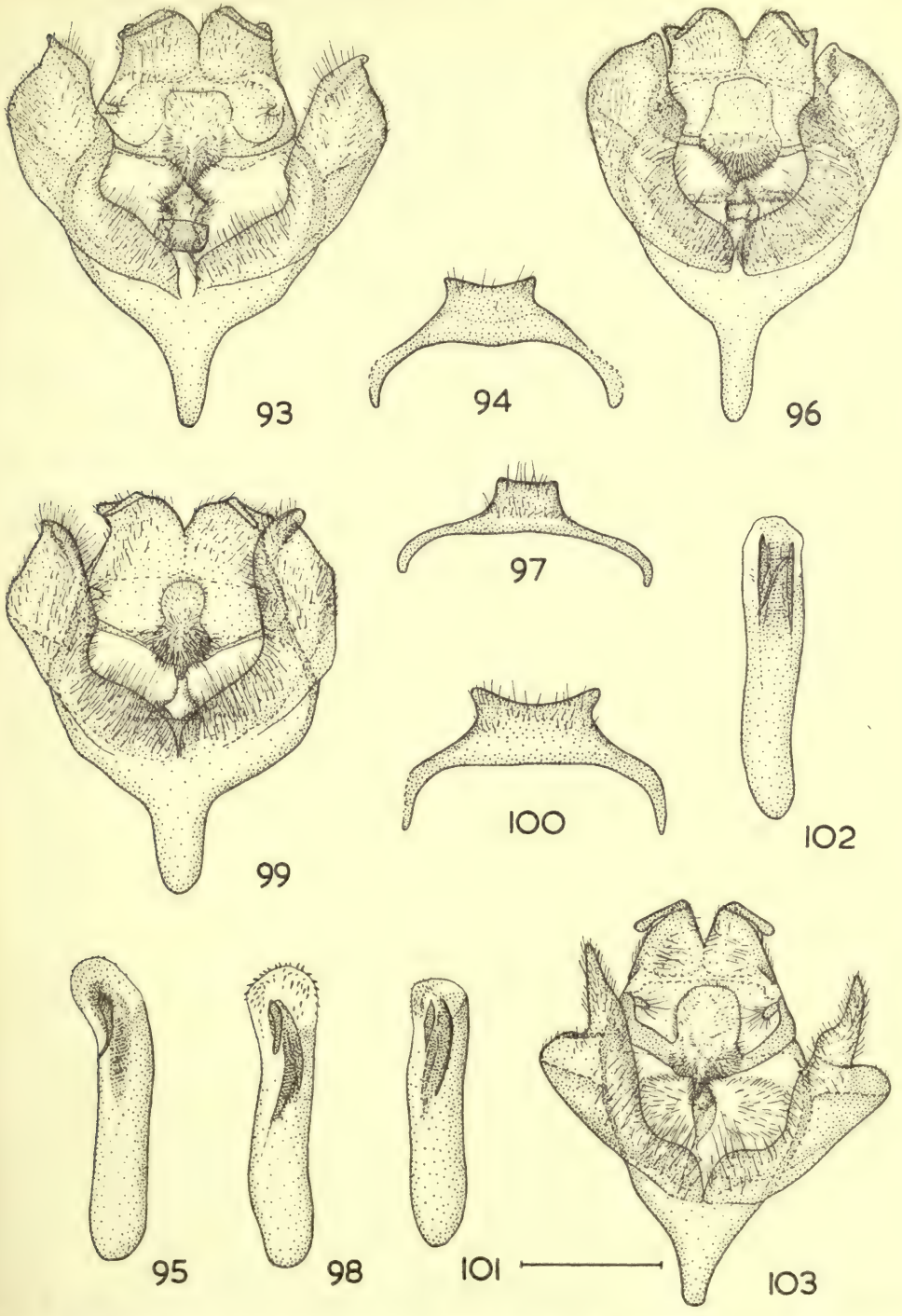
FEMALE. 44·6 mm. (1). As for male but with following differences. Longest antennal pectination about one-half greatest diameter of eye. Upperside of thorax and abdomen O/OOY–17–5°, except for narrow, whitish, anterior thoracic border. Outer margin of fore wing slightly convex. Upperside of fore wing O/OOY–14–7° ; costal area darker from base to two-thirds length of costa, and between postmedial and apex ; all cell spots edged with OOS/O–9–5° ; medial fasciae similarly marked, subterminal slightly darker especially anteriorly ; no medial shade (cf. female *exemplata*) ; marginal shade not extending posterior to M_3. Ground colour and colour of fasciae of hind wing as for fore wing. Whole of upperside of both wings lustrous except for markings of subterminal between R_5 and M_3 in fore wing, and area distal to subterminal in hind wing as for fore wing ; most distinctly lustrous near costa and base of fore wing.

GENITALIA. As for *examplata* but with following differences.

MALE. (Text-figs. 96–98). Apex of valve broader, ventral margin strongly convex near base. Anellus smaller, greatest transverse width equal to half greatest diameter of aedeagus ; invaginate medial part shallow and open, not pouch-like. Outer cornutus of aedeagus shorter, equal to half length of inner cornutus ; vesical spines longer, longest equal in length to greatest width of outer cornutus. Eighth sternite variable in size, but with posterior margin only slightly concave.

FEMALE (Text-fig. 91). Minutely spinose patch at posterior margin of preostial sternite narrower ; dorsoposterior lobes of segment smaller, not larger, than lateral lobes of ostial segment. Anterior lip of ostium not crescentic. Dorsolateral lobes of ostial segment hairy. Basal glabrous part of ovipositor lobes more strongly dilated ; dorsal lobes only indistinctly separated from each other posteriorly.

Brown form. The female has been described above. The male is similar to the female but with the following differences. Antennae and shape of fore wing as for male described above. Upperside of fore wing with medial shade OOS–6–6° ; transverse fasciae slightly darker than in female.



FIGS. 93–95 *Tridrepana examplata* Warren, lectotype male. 93, Genitalia. 94. Eighth sternite. 95. Aedeagus.

FIGS. 96–98. *T. olivacea olivacea* Warren, male. 96. Genitalia. 97. Eighth sternite. 98. Aedeagus.

FIGS. 99–101. *T. o. crocata* ssp. n., holotype male. 99. Genitalia. 100. Eighth sternite. 101. Aedeagus.

FIGS. 102 and 103. *T. obliquitaenia* Warren, holotype male. 102. Aedeagus. 103. Genitalia.

DIAGNOSIS. Distinguished from *examplata*, in the male, by the more finely marked, strongly lunulate postmedial on the upperside of the fore wing (in the yellow form, also by the less distinct lustrous areas).

GENITALIA. Separated from *examplata* by the shape of the anellus in the male, and by the presence of a hairy lobe on each side of the posterior margin of the ostial segment in the female.

DISCUSSION. Of the fifty-six specimens exmained, thirty-five belonged to the brown form, and the remaining specimens to the yellow form of the species. In the closely related and sympatric *examplata* all the specimens examined corresponded to the yellow form of *olivacea* ; in the sympatric *mediata*, all the specimens closely corresponded to the brown form, being brown above and yellow beneath.

DISTRIBUTION. Distributed throughout New Guinea, extending to Goodenough Is. in the south-east of its range.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 14 ♂, Dutch New Guinea, Snow Mts., Upper Setekwa R., 2–3,000 ft., Sept.1910, A.S. Meek (including holotype ♂ of *semirufa* Warren and *diluta* Warren) ; 5 ♂, Snow Mts., nr. Oetakwa, up to 3,500 ft., x, xii.1910, Meek (including holotype ♂ of *elegans* Warren) ; 3 ♂, Wandammen Mts., 3–4,000 ft., Nov.1914, A. C. and F. Pratt. The following specimens are of the brown form of the species : 3 ♂, 1 ♀, from type locality (including holotype ♀ of *tristigma*) ; 1 ♂, Goodenough Is., 2,500–4,000 ft., May 1913, A. S. Meek ; 11 ♂, Hydrographer Mts., 2,500 ft., Jan., Jan.–May, Feb.1918, Eichhorn Bros ; 2 ♂, Brit. N. G. Mafulu, 4,000 ft., i.1934, L. F. Cheesman ; 2 ♂, Mt. Kebea, 3,000 ft, March, April, July 1903, A. E. Pratt ; 7 ♂, Mambare R., Biagi R., Saiko, 5,500–6,000 ft., Sept. 1936, F. Shaw Mayer ; 2 ♂, Angabunga R., affl. of St. Joseph R., 6,000 ft., upwards, Nov.'04–Febr.'05, A. S. Meek ; 5 ♂, Dutch N. G. Central Arfak Mts., Ninay Valley, 3,500 ft., Feb., March '09 ; 1 ♂, Arfak, Mt. Siwi, 800 m., iv–vi. 1928, Dr. E. Mayr.

Tridrepana olivacea crocata ssp. n.

pro parte *Iridrepana examplata* Warren, 1922, *Gross-Schmetterl.* **10** : 465.

TYPE. Holotype male, New Britain, Talesea, January 1925, A. F. Eichhorn ; Drepanidae genitalia slide no. 388.

DESCRIPTION : MALE. 41·4, 38·4–42·4 mm. (6). As for nominate race but with following differences. Ground colour of upperside of fore wing OOY–17–12° ; medial shade OOS/O–10–11° ; mid–cell spot larger than remaining spots ; markings of postmedial between M_3 and Cu_2 less strongly lunulate ; marginal shade not extending posterior to M_3. Wing lightly irrorated with lustrous scales from base to near distal edge of medial shade, most distinctly at base and in costal area ; cell spots and marginal shade lustrous ; subterminal lustrous except for markings between M_3 and Cu_2, and dark centres of anterior markings. Ground colour of hind wing as for fore wing ; posterodistal more broadly edged with darker scales ; postmedial more diffusely marked, as in *examplata* ; wing very lightly irrorated with lustrous scales from base to postmedial, posterodistal spot and anterior markings

of subterminal also lustrous. Ground colour of underside of both wings OOY/O–18–11°, fore wing slightly darker anterobasally ; marginal shade on fore wing more strongly marked.

FEMALE. 46·8, 45·2–49·4 mm. (5). As for male but with following differences. Longest antennal pectination two-thirds greatest diameter of eye. Outer margin of fore wing slightly convex ; upperside without medial shade (cf. female *examplata*), ground colour OOY–18–12° ; medial fasciae and edges of cell spots OOS/O–6–4°, subterminal slightly darker ; dark area surrounding posterodistal spot sometimes extending posteriorly to Cu_2 ; marginal shade extending posteriorly to M_2, with trace between M_2 and M_3 . Wing lustrous from base to immediately distal to postmedial posteriorly, and to outer margin anteriorly ; markings of subterminal lustrous between apex and M_3, irrorated with lustrous scales posterior to M_3. Hind wing colour as for fore wing ; short additional, whitish streak at base of Cu_1 and Cu_2 posterior to posterodistal cell spot, all surrounded by area of dark scales. Wing lustrous from base to immediately distal to postmedial ; subterminal irrorated with lustrous scales. Ground colour of underside of both wings OOY–18/19–12° ; markings weaker.

GENITALIA. As for nominate race but with following differences.

MALE (Text-figs. 99, 100, 101). Saccus shorter and wider. Valve with bulge at two-fifths ventral margin less well developed. Anterior flattened part of anellus wider, width equal to greatest diameter of aedeagus. Vesical spines of aedeagus shorter, longest equal to one-third greatest width of outer cornutus. Eighth sternite variable in size, but with transverse width usually over one-half greatest width of eighth tergite.

FEMALE (Text-fig. 92). Minutely spinose patch at posterior margin of preostial sternite broader. Basal glabrous part of ventral ovipositor lobes smaller.

DIAGNOSIS. Distinguished from the nominate race by the colour of the upperside in the male, and by the larger mid-cell spot in both sexes. The genitalic characters given above readily separate the race from the nominate race and from *examplata*.

DISCUSSION. It is possible, though improbable, that the taxon described above is a subspecies of *examplata*. Further collecting may show that both *olivacea* and *examplata* are represented in Rook Is. and New Britain.

No form analogous to the brown form of *olivacea* appears to be present in these islands.

DISTRIBUTION. Rook Is. and New Britain. Sixteen males from New Ireland may belong to this race.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : allotype ♀, from type locality, March–April, 1925, A. F. Eichhorn, Drepanidae genitalia slide no. 395 ; 4 ♂ and 2 ♀ paratypes, from type locality, February, Feb.–March, Mar.–April 1925, A. F. Eichhorn ; 2 ♀ paratypes, 1 ♂, Rook Isl., July, August 1913, A. S. Meek.

Tridrepana cervina Warren

Iridrepana cervina Warren, 1922, *Gross-Schmetterl.* **10** : 465. (fig.)
Tridrepana cervina Warren, Gaede, 1931, *Lepid. Cat.* **49** : 28.

TYPE. Holotype female, Brit. N. G., Mambare R., Biagi, 5,000 ft., Feb. '06, A. S. Meek.

DESCRIPTION. 44·4 mm. (1). Similar to brown form of *olivacea* but with following differences. Upperside of both wings more reddish, O–15–6/7° ; posterodistal spot in fore wing OOS–8–6° ; mid-cell spot and discocellular spot not edged with dark scales, former spot almost obsolete ; subterminal only developed anterior to M_3. Subterminal of hind wing just visible as extremely faint interneural dashes. Underside of both wings O/OOY–18–11°, without markings, but with markings of upperside showing through faintly.

GENITALIA. Not known (abdomen of holotype not genuine).

MALE. Not known.

DIAGNOSIS. Distinguished from the brown form of *olivacea* by the weakly marked colour pattern on the upperside of both wings and the almost obsolete subterminal in the hind wing.

DISCUSSION. The specimen described above may be conspecific with *olivacea* : further females of the brown form of *olivacea* might help to solve the problem.

DISTRIBUTION. British New Guinea.

Tridrepana obliquitaenia Warren

Iridrepana obliquitaenia Warren, 1922, *Gross-Schmetterl.* **10** : 465. (fig.)
Tridrepana obliquitaenia Warren, Gaede, 1931, *Lepid. Cat.* **49** : 29.

TYPE. Holotype male, Brit. N. Guinea, Kumusi R., low elev., July '07, A. S. Meek ; Drepanidae genitalia slide no. 409.

DESCRIPTION : MALE. 37·7, 35·2–41·8 mm. (14). Outer surface of palp, antenna, and head between and posterior to antennae OOY–15–11° ; head O–9–12° anterior to antennae, to OOY–18–10° above labrum ; antennal shape as for *examplata*.

Thorax with narrow whitish anterior border, rest of thorax and abdomen OY/YYO–18/19–12° above, OOY–19–10° beneath. Fore wing strongly falcate (less strongly than in *examplata*) ; outer margin straight except at apex ; venation as for *examplata*. Ground colour of upperside of fore wing as for thorax ; costa O–15–11°, lightly irrorated with darker scales ; antemedial from one-quarter costa, arched outwards (convex distally) to one-third inner margin ; postmedial from three-quarters costa to two-thirds inner margin, strongly lunulate between M_3 and Cu_2 ; oblique medial shade from just proximal to apex to posterior end of antemedial, narrow posteriorly, extended inwards anterior to cell to one-half costa, distal margin straight ; medial shade and fasciae O–9–9° ; subterminal faintly marked as interneural dashes posteriorly, expanded into rounded spots between M_1 and M_3, markings between apex and M_3 faintly edged distally with whitish scales ; very small posterodistal and discocellular spot, mid-cell spot minute or absent ; marginal shade between apex and Cu_1, O–5–7° ; fringe bordering marginal shade and between Cu_1 and Cu_2 O–5–7°. Wing lustrous from base to distal margin of medial shade, most distinctly lustrous along costa ; postmedial, subterminal (except for dark

centres of enlarged anterior markings) and marginal shade also lustrous. Colours of hind wing as for fore wing ; antemedial well marked, straight, forming continuous line with medial shade of fore wing ; postmedial from two-thirds inner margin, strongly dentate posteriorly ; trace of whitish posterodistal spot ; subterminal as in anterior part of fore wing. Wing irrorated with lustrous scales proximal to postmedial, most distinctly lustrous near base ; markings of postmedial and subterminal lustrous. Underside of both wings OOY–18–12°, except for proximal half of fore wing which is OOY–15–10° ; trace of discocellular spot ; postmedial strongly marked anteriorly, faintly marked posteriorly ; subterminal well marked from apex to M_3 ; trace of marginal shade ; fringe of outer margin as for upperside, but continuing dark to near tornus. Hind wing without markings.

FEMALE. Not known.

GENITALIA : MALE. (Text-figs. 102, 103). As for *examplata* but with following differences. Saccus shorter. Valve digitate apically. Anellus without pocket-like invagination ; only slightly concave anteriorly. Broad, hairy depression lateral to anellus. Medial part of gnathus differently shaped ; lateral arms broader. Uncus without angulate posterior shoulders. Outer cornutus of aedeagus more slender, inner cornutus more heavily sclerotized ; vesica minutely spinose, with group of longer spines on side opposite outer cornutus. Eighth sternite small, truncate posteriorly. Eighth tergite as long as its greatest transverse width, four times as wide anteriorly as least width of eighth sternite ; posterior processes sometimes equal in length to one-half length of posterior margin of tergite.

DIAGNOSIS. Easily distinguished from the other species of the species group by the colour pattern of the upperside.

DISTRIBUTION. Distributed throughout New Guinea (including Waigeu in the north-west of its range).

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 3 ♂, from type locality, June, Aug. '07, A. S. Meek ; 1 ♂, Dutch New Guinea, Humboldt Bay distr., Uskwar, 3.ix.1937 ; 1 ♂, Mt. Nomo, S. of Mt. Bougainville, 7,000 ft., ii.1936 ; 1 ♂, Snow Mts., nr. Oetakwa R., up to 3,500 ft., x.xii.1910, Meek ; 1 ♂, Weyland Mts., Mt. Kunupi, Menoo Valley, 6,000 ft., Nov. and Dec. 1920, C., F., and J. Pratt ; 1 ♂, Geelvink By., Nomnagihé, 25 miles south of Wangaar, 2,000 ft., Jan.–Feb. 1921, C., F., and J. Pratt ; 4 ♂, Waigeu, Camp Nok, 2,500 ft., iv, v. 1938, L. E. Cheesman.

Species group *postica* Moore

The group contains three species. One, *rectifascia* sp. n., is placed here provisionally : the colour pattern is similar to the remaining species but the male genitalia is quite different. The colour pattern of the upperside of both wings is unlike that of any other species group (Pl. 2, figs. 1–4).

argentistriga Warren is polytypic.

A dark patch of thickened (sensory ?) scales is present at the base of the cell on the underside of the fore wing in *rectifascia* sp. n.

Tridrepana postica (Moore)

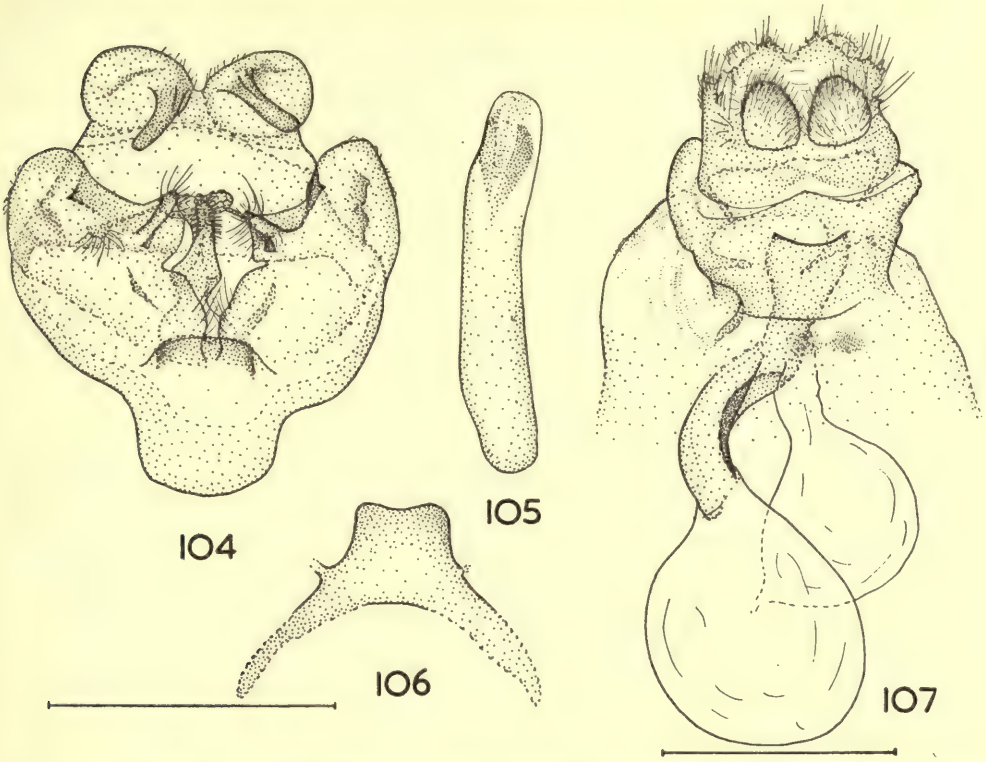
Drepana postica Moore, 1879, *Lepid. Atk.* p. 84.
Drepana postica Moore, Cotes and Swinhoe, 1887, *Cat. Moths India* p. 184.
Drepana postica Moore, Hampson, 1893, *Fauna Brit. India Moths* **1** : 337.
Drepana postica Moore, Dudgeon, 1899, *J. Bombay nat. Hist. Soc.* (4) **12** : 653.
Iridrepana postica (Moore), Warren, 1922, *Gross-Schmetterl.* **10** : 466.
Tridrepana postica (Moore), Gaede, 1931, *Lepid. Cat.* **49** : 30.
Drepana xanthoptera Hampson, 1893, *Fauna Brit. India Moths* **1** : 341.
Tridrepana xanthoptera (Hampson), Swinhoe, 1895, *Trans. R. ent. Soc. Lond.* **1895** : 4.

TYPE. Holotype male, Darjiling. (in Zoologisches Museum der Humboldt Universität, Berlin).

DESCRIPTION : MALE (Pl. 3, fig. 1). 30·6, 27·4–37·4 mm. (9). Outer surface of palp O–14–9° ; antennae and head between and posterior to antennae O–18–12° ; head anterior to antennae OOS–6–12°, to O–17–8° above labrum ; longest antennal pectination equal to one and a quarter times greatest diameter of eye. Thorax with narrow whitish anterior border, rest of thorax and abdomen OY–19–12° above, OOY–19–6° beneath. Venation of both wings as for *albonotata*. Fore wing moderately falcate, outer margin straight ; ground colour of upperside as for thorax ; trace of antemedial from one-quarter costa to one-third inner margin ; minute white posterodistal spot (sometimes two closely apposed spots) ; similar but smaller discocellular spot ; both spots usually edged with darker scales ; usually with medial shade between medial fasciae, extending distally in anterior half of wing to meet marginal shade, O–13–6° to OOS–13–6° ; postmedial from four-fifths costa to just distal to posterior end of antemedial, straight except at costa ; strongly marked ; subterminal of minute interneural spots or dashes, lunulate and edged with whitish scales between apex and M_3 ; diffusely marked marginal shade ; fringe of outer margin slightly darker than marginal shade from apex to near tornus. All scales of fore wing lustrous except for dark edge of cell spots, and narrow areas between anterior part of postmedial and subterminal. Ground colour of hind wing as for fore wing ; antemedial well marked, forming continuous line with postmedial of fore wing ; minute white discocellular spot and similar but larger posterodistal spot (sometimes two closely apposed spots) ; postmedial from one-quarter inner margin, nearly straight to M_3 then very slightly curved inwards round end of cell ; subterminal as in posterior part of fore wing ; wing lustrous except for small area surrounding cell spots. Underside of fore wing OOY–17/18–12°, darker proximally ; postmedial as for upperside but slightly lighter in colour ; subterminal usually well marked as small dark interneural spots ; fringe of outer margin as for upperside, or darker. Hind wing OOY–18/19–12° ; trace of transverse fasciae.

FEMALE. 38·0, 35·8–40·2 mm. (2). (Specimens badly worn). Apparently no significant differences from male.

GENITALIA : MALE (Text-figs. 104, 105, 106). Saccus short and broad. Valve small, apically rounded ; ventral margin with irregularly shaped lobe at three-fifths, and hairy oblique ridge on inner surface ; heavily sclerotised, sharply pointed process just inside ventral margin near apex, recumbent on inner surface of valve.



FIGS. 104–106. *Tridrepana postica* (Moore), male. 104. Genitalia. 105. Aedeagus. 106. Eighth sternite.

FIG. 107. *T. postica* (Moore), female, genitalia.

Anellus poorly developed, forming rounded plate ventral to base of aedeagus. Medial part of gnathus scobinate, minutely spinose and strongly evaginated posteriorly, flattened anteriorly; lateral arms very slender. Socius very small. Uncus weakly emarginate medially forming rounded lobe on either side; each lobe with slightly arcuate, digitate process ventrally. Aedeagus without cornuti; vesica minutely scobinate. Posterior margin of eighth sternite slightly concave. Eighth tergite. twice as wide transversely at its base as least width of eighth sternite, gradually tapered posteriorly; flattened spatulate lobe on each side near posterior margin, equal in length to just over half width of tergite at that point.

FEMALE (Text-fig. 107). Posterior margin of preostial sternite with small minutely spinose patch on either side of medial line. Bursa copulatrix without ornamentation. Ductus bursae well sclerotized, bent towards left side of abdomen; slightly furrowed anteriorly; conspicuous sulcus on right-hand side between bursa and junction of its duct with spermathecal duct. Spermatheca without ornamentation. Ventral ovipositor lobes papillate and hairy; dorsal lobes forming hood-like structure, papillate and hairy posteriorly, weakly emarginate posteromedially.

DIAGNOSIS. Distinguished from *argentistriga* by the presence of a subterminal fascia on the upperside of the hind wing.

DISTRIBUTION. N.E. India and Malaya.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 6 ♂ Khasis, Feb. 1894, Mar.1895, Aug., Oct.1896, Feb.1897, Nat. Coll.; 1 ♂, Khasia Hills, Nissary; 1 ♂, Cherrapunji, July 1893; 1 ♂, Naga Hills, 1,500 ft., Sept.–Oct.1889, W. Doherty (holotype of *xanthoptera* Hampson); 1 ♂, Malay States, Bukit Kutu, 3,300 ft., vii.28, A. R. Sanderson.

Tridrepana argentistriga argentistriga Warren

Tridrepana argentistriga Warren, 1896, *Novit. zool.* **3**: 339.
Iridrepana argentistriga Warren, Warren, 1922, *Gross-Schmetterl.* **10**: 466.
Tridrepana argentistriga Warren, Gaede, 1931, *Lepid. Cat.* **49**: 28.

TYPE. Holotype female, N. Borneo, Mt. Mulu, 1–4,000 ft., Hose; Drepanidae genitalia slide no. 415.

DESCRIPTION: MALE. 29·6, 28·0–31·2 mm. (2). As for *postica* but with following differences. Upperside of fore wing with mid-cell spot absent, and posterodistal spot very faintly marked or absent; markings of subterminal usually confluent, forming distinct whitish crescent anteriorly. Subterminal absent in hind wing. Anterior part of subterminal less distinctly marked on underside of fore wing.

FEMALE (Pl. 3, fig. 2). 34·9, 32·0–39·0 mm. (6). As for male (including attenna).

GENITALIA. As for *postica* but with following differences.

MALE (Text-figs. 108, 109, 110). Valve without pointed process on ventral margin. Posterior part of gnathus discoid. Uncus not expanded posterolaterally. Aedeagus with conspicuous ornamentation. Eighth sternite differently shaped, posterior margin slightly convex; apodemes very short. Eighth tergite about twice as long as its greatest transverse width, greatest width one and a quarter times least width of eighth sternite, slightly tapered posteriorly; spatulate processes shorter, equal in length to less than half width of tergite at that point; second process on each side posterior to spatulate processes, subpyramidal and hairy.

FEMALE (Text-fig. 111). Preostial sternite with spinose patch much reduced in size. Ductus bursae twisted through 180°; anterior margin of ostium more strongly convex. Dorsal ovipositor lobes better developed, raised along mid-dorsal line and produced further posteriorly; medial emargination more pronounced.

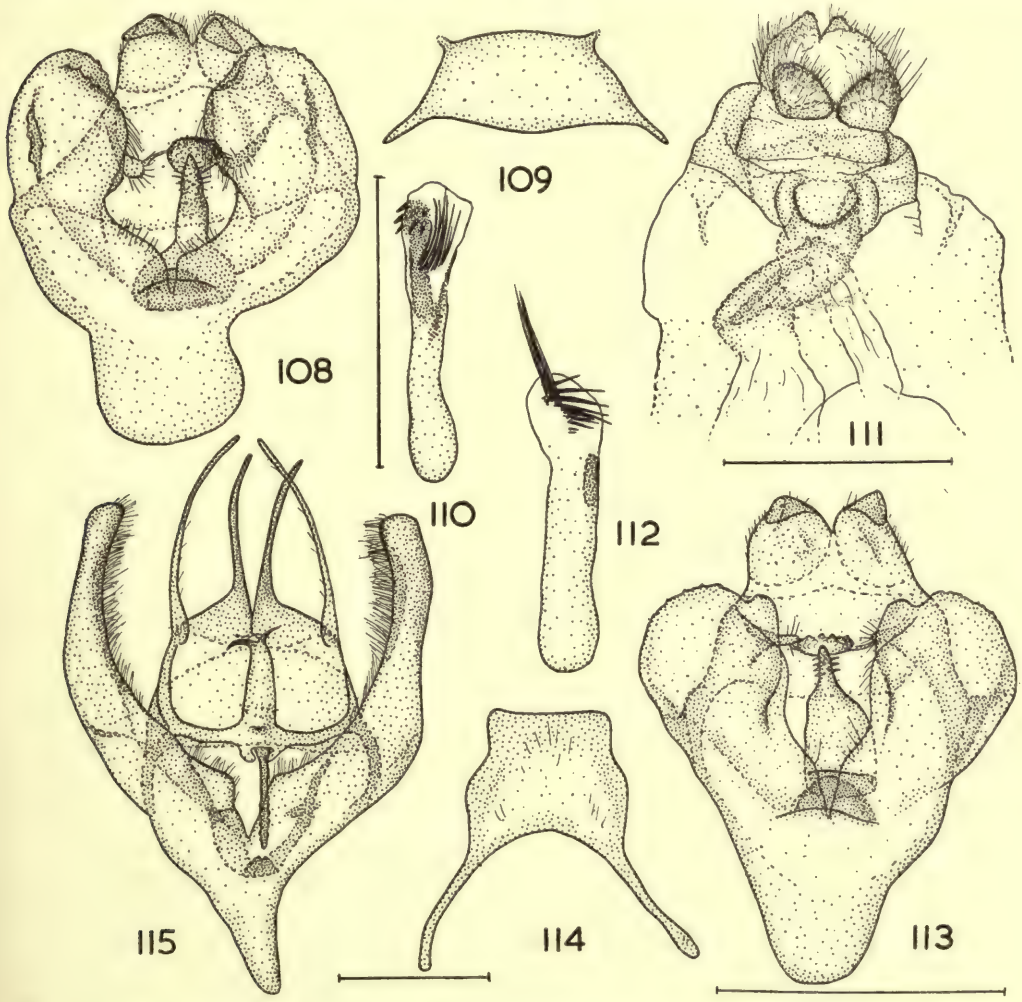
DIAGNOSIS. Distinguished from *postica* by the absence of a subterminal fasciae on the upperside of the hind wing.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂, West Java, Perbawatie, Mt. Gede, 4–4,500 ft., i.1938; 1 ♂, W. Sumatra, Lebong Tandai, 1920–1923, C. J. Brooks; 1 ♀, S.W. Sumatra, Lebong Sandai, Benkoelen; 1 ♀, Singapore, Cayanagh, Dec.1915, V. K. Coll; 1 ♀, Sarawak, Bidi, 1907–1908, C. J. Brooks. RIJKSMUSEUM VAN NATUURLIJKE HISTORIE, LEIDEN: 1♂, Java occ., Sindanglaya, 1881; 1 ♀, W. Java, Buitenz., 1894.

Tridrepana argentistriga brevilinea ssp. n.

TYPE. Holotype male, S.W. Celebes, G. Lampobattang, Parang-bobo Goa, 5,000 ft., May 1938, J. P. A. Kalis ; Drepanidae genitalia slide no. 422.

DESCRIPTION. MALE (Pl. 3, fig. 3). 29·9, 29·8–30·0 mm. (2). As for nominate race with following differences. Medial shade on upperside of fore wing confined to narrow area immediately proximal to postmedial, but extending to subterminal



FIGS. 108–110. *Tridrepana argentistriga argentistriga* Warren, male. 108. Genitalia. 109. Eighth sternite. 110. Aedeagus.

FIG. 111. *T. a. argentistriga* Warren, female, ventral view of genitalia.

FIGS. 112 and 113. *T. a. brevilinea* ssp. n., holotype male. 112. Aedeagus. 113. Genitalia.

FIGS. 114 and 115. *T. rectifascia* sp. n. 114. Eighth sternite. 115. Genitalia.

near costa ; subterminal only developed anterior to M_2, most strongly marked near apex ; wing lustrous except for narrow band extending immediately proximal to subterminal anteriorly to just proximal to tornus. Hind wing with postmedial parallel to outer margin ; wing lustrous except for narrow band situated parallel to outer margin and mid-way between it and postmedial, and narrow area round posterodistal spot. Underside of fore wing with faintly marked postmedial ; hind wing unmarked.

GENITALIA : MALE. (Text-figs. 112, 113). As for nominate race but with following differences. Apex of valve with small ventral bulge. Posterior scobinate part of gnathus transversely elongate. Armature of vesica strikingly different.

FEMALE. Not known.

DIAGNOSIS. Distinguished from the nominate race by the poorly developed subterminal on the upperside of the fore wing, and the distribution of lustrous scales on both wings.

DISTRIBUTION. W. and S.W. Celebes.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 1 ♂, W. Celebes, Paloe, Koelawi, 3,100 ft., March 1937, J. P. A. Kalis.

Tridrepana rectifascia sp. n.

TYPE. Holotype male, Mindanao, Lanao, Kolambugan plains, 20 June 1914, A. E. Wileman ; Drepanidae genitalia slide no. 423.

DESCRIPTION : MALE (Pl. 3, fig. 4). 34·4, 33·0–35·8 mm. (2). Outer surface of palp, and head between and posterior to antennae O–14–11° ; head anterior to antennae OOS–6–12°, to OY–19–12° above labrum ; antenna OY–18/19–12° ; longest antennal pectination just shorter than greatest diameter of eye.

Thorax with narrow whitish anterior border ; rest of thorax and abdomen OY–18/19–12° above, OY–19–12° beneath. Fore wing moderately falcate apically ; outer margin slightly convex. Venation of fore wing as for *albonotata* ; ground colour of upperside as for thorax ; costa irrorated with O–9–11° ; trace of antemedial ; postmedial strongly marked, O–9–11° ; shape and position of both medial fasciae as for *postica* ; well marked, white mid-cell spot and discocellular spot ; subterminal well marked, OSS–3–12°, consisting of interneural dashes posteriorly, markings enlarged between apex and M_2 and edged with whitish scales distally ; marginal shade between anterior part of subterminal and outer margin from apex to mid-way between M_2 and M_3, O–9–11° ; fringe bordering shade similarly coloured. Wing lustrous except for circular area round each cell spot, narrow area between subterminal and postmedial, and area distal to subterminal. Hind wing venation as for *albonotata* ; colour of markings as for fore wing ; antemedial strongly marked, continuous with postmedial of fore wing, straight, as for *postica* ; small posterodistal spot ; postmedial similar to *postica* but parallel to outer margin, less strongly marked than antemedial ; subterminal of minute interneural dashes. Underside of both wings as for thorax. Fore wing with trace of anterior part of postmedial and subterminal, and marginal shade ; posterior part of postmedial shows through faintly from upperside ; small, ovate (sensory ?) patch of dark, raised scales placed

obliquely at base of wing between Cu_2 and 2A. Frenulum minutely but distinctly clavate. Underside of hind wing without markings; area of elongate scales in cell, and area of short bristly scales between cell and inner margin.

GENITALIA: MALE (Text-figs. 114, 115). Saccus moderately long, tapered. Valve long, slightly arcuate, apically truncate. Anellus forming flattened band on each side of base of aedeagus; bands fuse dorsally to form rounded, posteriorly directed plate, minutely emarginate posteromedially. Medial part of gnathus produced posteriorly as free apically bifurcate process, and anteriorly as heavily sclerotized, dorsoventrally flattened process terminating close to posterior margin of anellus; lateral arms well developed. Socius long and slender. Uncus bifurcate nearly to base into pair of long, slender, down-curved arms. Length of sclerotized part of aedeagus five-sixths length of ventral margin of valve; outer cornutus about one-third length of inner cornutus; vesica minutely spinose, longest spine equal to half greatest width of outer cornutus. Eighth sternite well developed; truncate posteriorly. Eighth tergite about three times as long as its least transverse width, just wider anteriorly than least width of eighth sternite, gradually tapered to three-quarters of its length then widened to posterior margin; apodemes equal in length to one-third length of anterior margin of tergite.

FEMALE. Not known.

DIAGNOSIS. Distinguished from *postica* and *argentistriga* by the more strongly marked subterminal on the upperside of the fore wing, the presence of a dark, (sensory ?) patch near the base of the underside of the fore wing, and the presence of a distinctly clavate frenulum.

The male genitalia is quite different from that of *postica* and *argentistriga*.

DISCUSSION. This species is particularly interesting in two respects: firstly in the possession of a dark, (sensory ?) patch of scales at the base of the underside of the fore wing (cf. *microcrocea*, *crocea* etc.); secondly in the similarity of the colour pattern to that of *postica* in contrast with the marked dissimilarity in the male genitalia between the two species.

DISTRIBUTION. Philippines (Mindanao).

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂, Philippines, Mindanao, Kolambuzau, Aug.–Sept. 22.

Species group *sadana* Moore

The group, which contains nine species, is easily distinguished from the remaining groups in nearly all cases by the following combination of characters: upperside of fore wing with five medial spots (including two accessory spots posterior to posterodistal spot); absence of medial shade; presence, usually, of double post-medial (at least posteriorly) on upperside of both wings; absence of dark patch of thickened (sensory ?) scales at base of cell on underside of fore wing in male. The general structure of the male genitalia is remarkably uniform, although it is usually possible to separate the species on male genitalic characters: the relatively smaller size of the whole of the external genitalic apparatus compared with the wing span is obvious from the drawings.

rubromarginata Leech is polytypic.

Tridrepana adelpha Swinhoe

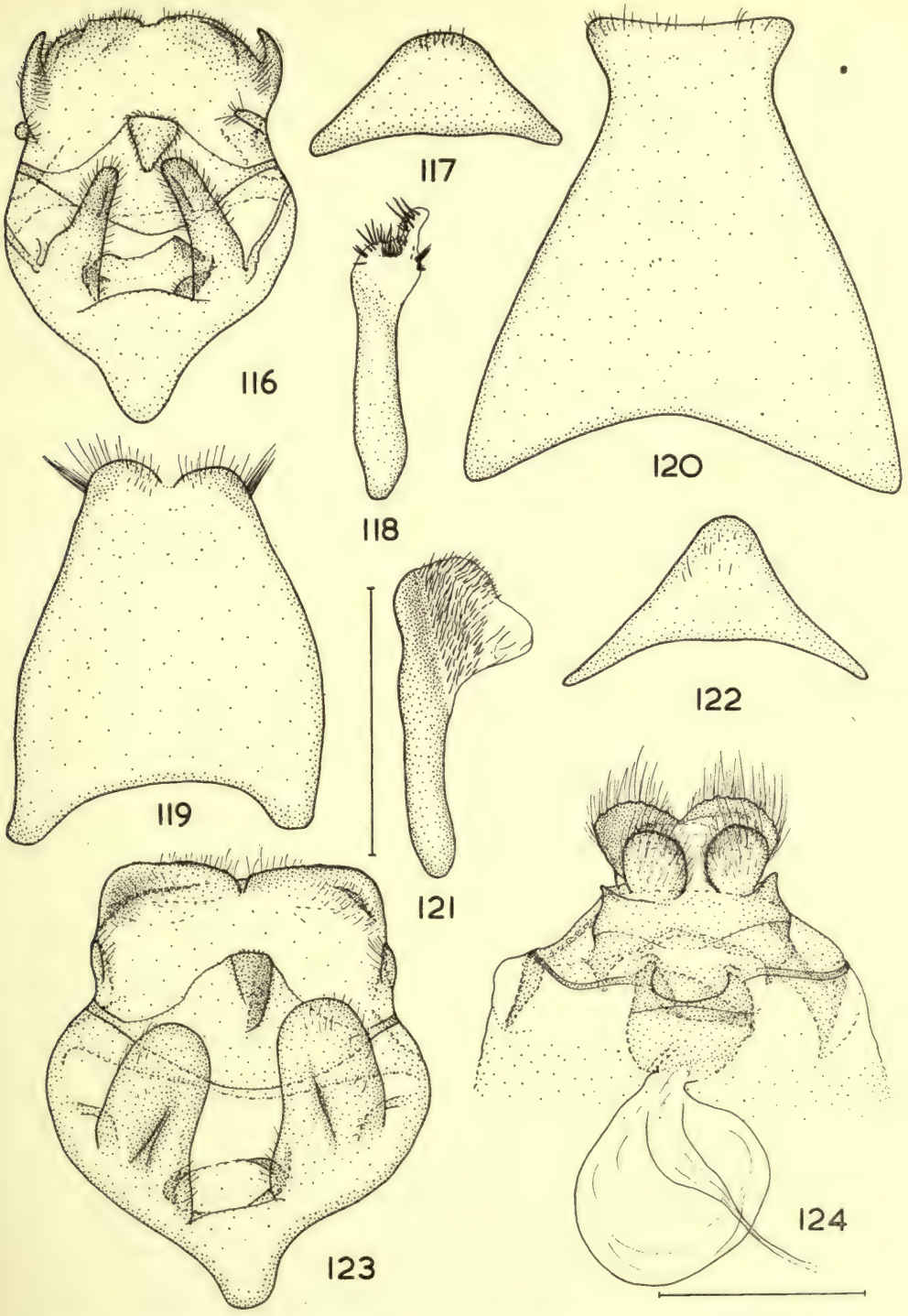
Tridrepana adelpha Swinhoe, 1905, *Ann. Mag. nat. Hist.* (7) **16** : 620.
Iridrepana adelpha Swinhoe, Warren, 1922, *Gross-Schmetterl.* **10** : 466.
Tridrepana adelpha Swinhoe, Gaede, 1931, *Lepid. Cat.* **49** : 28.
Drepana sadana Moore, Hampson, 1910, *J. Bombay nat. Hist. Soc.* (1) **20** : 98.

TYPE. Holotype male, Khasis, Nat. Coll.; Drepanidae genitalia slide no. 426.

DESCRIPTION : MALE (Pl. 3, fig. 6). 32·5, 29·8–25·6 mm. (13). Head immediately anterior to antennae O–11–11° ; rest of head, outer surface of palp and antenna OOY–18–10° ; longest antennal pectination equal to one and a half times greatest diameter of eye.

Thorax with narrow whitish anterior border, rest of thorax and abdomen OY–18/19–12° above, OOY–19–11° beneath. Fore wing strongly falcate apically, outer margin slightly convex ; venation as for *albonotata*, but with R_1 usually from half areole. Ground colour of fore wing as for thorax but OOY–18–12° anterior to cell ; antemedial represented by short dash near base of cell, lunulate dash between Cu_1 and Cu_2, and spot at one-quarter length of inner margin ; small, dark mid-cell spot and similar discocellular spot ; slightly larger, white posterodistal spot ; conspicuous rectangular spot placed obliquely posterior to latter spot between M_3 and Cu_2, similar spot between Cu_1 and Cu_2, both SO/OOS–4–9° ; posterodistal spot and spots posterior to it surrounded by area of SO/OOS–12–3° ; postmedial from three-quarters costa, formed by interneural dashes between costa and M_2, lunulate between M_2 and Cu_2 ; weakly marked, diffuse dash just distal to postmedial between Cu_2 and 2A (may represent distal postmedial line) ; subterminal only developed between R_5 and M_3, sometimes only single spot present between M_1 and M_2 ; marginal shade between anterior markings of subterminal and outer margin from apex to mid-way between M_3 and Cu_1, SO/OOS–12–3° ; fringe bordering marginal shade SO/OOS–4–9°, but with light grey edge ; costa irrorated with greyish-brown scales proximally. Ground colour of hind wing as for fore wing ; trace of antemedial from one-third inner margin ; mid-cell spot absent ; pattern of remaining medial spots as for fore wing, but slightly lighter in colour and with most posterior spot sometimes absent and greyish-brown area sometimes not extending to discocellular spot ; postmedial from two-thirds inner margin, lunulate between M_3 and Cu_2 ; trace of distal postmedial line between Cu_2 and 2A ; subterminal absent. Both wings non-lustrous. Underside of both wings OY–19–10°, fore wing slightly darker anterior to cell. Fore wing with trace of anterior part of distal postmedial line and medial spots ; other markings of upperside show through faintly ; outer margin fringe as for upperside. Hind wing with trace of medial spots ; markings of upperside show through faintly.

GENITALIA : MALE (Text-figs. 116–119). Saccus short. Valve small, digitate, outer surface longitudinally sulcate close to ventral margin. Anellus forming complete ring round base of aedeagus ; produced posteriorly for short distance on either side of medial line as weakly sclerotised plate. Lateral arms of gnathus slender laterally, broadened medially into dorsoventrally flattened plate with raised, minutely spinose pad posteriorly. Socius moderately long. Uncus with small



FIGS. 116–119. *Tridrepana adelpha* Swinhoe, holotype male. 116. Genitalia. 117. Eighth sternite. 118. Aedeagus. 119. Eighth tergite.

FIGS. 120–123. *T. finita* sp. n., holotype male. 120. Eighth tergite. 121. Aedeagus. 122. Eighth sternite. 123. Genitalia.

FIG. 124. *T. finita* sp. n., allotype female, genitalia.

medial emargination ; produced laterally on each side as stout, falcate process. Aedeagus slightly dilated apically ; vesica with distinctive spiny armature. Eighth sternite evenly rounded posteriorly ; very slightly concave laterally ; apodemes short. Eighth tergite bilobed posteriorly and fringed with long, stout hairs.

FEMALE. Not known.

DIAGNOSIS. Distinguished from its closest apparent relative *finita* by the more strongly falcate fore wing, and the larger greyish brown area surrounding the posterior medial spots. In the genitalia the shape of the uncus, and the less numerous but longer vesical spines provide similarly diagnostic characters.

DISTRIBUTION. N.E. India.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 18 ♂, from type locality ; 3 ♂, Cherrapungi, April, Nov. 1893, Jan. 1894. RIJKSMUSEUM VAN NATUURLIJKE HISTORIE, LEIDEN : 1 ♂, Assam, Hamilton.

Tridrepana finita sp. n.

TYPE. Holotype male, China, Provinz Nord-Yuennan, Li-kiang, 9.vii.1934, H. Höne ; Drepanidae genitalia slide no. 432 (in Zoologisches Forschungsinstitut u. Museum A. Koenig, Bonn).

DESCRIPTION : MALE (Pl. 3, fig. 7). 42·7, 38·8–47·4 mm. (7). Head posterior to antennae, outer surface of palp, and antenna OOY–18–12° ; head OOS–6–12° between and anterior to antennae, to OOY–16–11° above labrum ; antennal shape as for *adelpha*.

Thorax with narrow, whitish anterior border ; rest of thorax and abdomen OOY–18–12° above, OOY–19–10° beneath. Fore wing moderately falcate ; outer margin slightly convex. Venation of both wings as for *adelpha*. Ground colour of upperside of both wings OOY–18–12°. Colour pattern of upperside of fore wings as for *adelpha* but with following differences : both medial fasciae, and all medial spots except for posterodistal spot darker ; greyish-brown area surrounding posterior medial spots relatively smaller ; anterior part of subterminal much more strongly marked ; marginal shade not extending posterior to M_3. Upperside of hind wing as for *adelpha* but with following differences : medial fasciae darker, postmedial more strongly lunulate at middle ; only trace of most posterior medial spot ; greyish-brown area surrounding posterior medial spots not extending to discocellular spot. Both wings non-lustrous. Underside of both wings OOY–18/19–12° ; fore wing irrorated with dark brown near base, especially at costa ; medial spots, anterior part of distal postmedial (and sometimes posterior part of proximal line) and anterior part of subterminal well marked in fore wing. Medial spots, postmedial, and subterminal usually moderately well marked in hind wing.

FEMALE. 48·8 mm. (1). As for male but with following differences. Longest antennal pectination one and a quarter times greatest diameter of eye ; spot near end of cell between Cu_1 and Cu_2 not joined to spot between M_3 and Cu_1.

GENITALIA : MALE (Text-figs. 120–123). Saccus small. Valve small, digitate ; longitudinal sulcus on outer surface. Anellus as for *adelpha*. Gnathus similar to *adelpha*, but with medial spinose pad more strongly evaginate. Uncus emarginate

medially, slightly produced posterolaterally. Aedeagus slightly dilated apically; base of vesica densely spinose. Eighth sternite similar to *adelpha*, but narrower posteriorly and bluntly pointed. Eighth tergite well developed.

FEMALE (Text-fig. 124). Bursa copulatrix without ornamentation; ductus bursae short, broadest and heavily sclerotized posteriorly. Ostial segment forming narrow band lateral to ostium. Postostial segment forming hood-like lip lateral to each ventral ovipositor lobe. Ventral ovipositor lobes papillate and densely hairy. Dorsal lobes united to form broad, bilobed hood-like structure; papillate and hairy posteriorly.

DIAGNOSIS. Distinguished from *adelpha* by the larger size and the less strongly falcate fore wing. The male genitalia is similarly diagnostic.

DISTRIBUTION. W. China.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♂ paratype, Thibet, Tchang-Kou, Chausseurs Chinois, Été 1892; 1 ♂, W. China, Tsé kou, 1900, R. P. J. Dubernard. NATURHISTORISCHES MUSEUM, VIENNA: 1 ♀ paratype, W. China, Ta-tsien-lou, 1910, Chausseurs Indigènes. ZOOLOGISCHES FORSCHUNGSINSTITUT U. MUSEUM A. KEONIG, BONN: allotype ♀ from type locality, 13.vii.1934, H. Höne, Drepanidae genitalia slide no.433; 2 ♂ paratypes, from type locality, 25.6, 26.vii.1935, H. Höne; 1 ♂ paratype, Nord-Yuennan, A-tun tse, ca. 4,500 m., 7.vii.1936, H. Höne.

Tridrepana sadana (Moore)

Drepana sadana Moore, 1865, *Proc. zool. Soc. Lond.* **1865**: 817.
Drepana sadana Moore, Cotes and Swinhoe, 1887, *Cat. Moths. India* p. 184.
Drepana sadana Moore, Hampson, 1893, *Fauna Brit. India Moths* **1**: 341.
Platypteryx sadana (Moore), Kirby, 1892, *Syn. Cat. Lep. Het.* p. 733.
Tridrepana sadana (Moore), Swinhoe, 1895, *Trans. R. ent. Soc. Lond.* **1895**: 4.
Drepana sadana Moore, Dudgeon, 1899, *J. Bombay nat. Hist. Soc.* (4) **12**: 655.
Drepana sadana Moore, Hampson, 1910, *J. Bombay nat. Hist. Soc.* (1) **20**: 98.
Iridrepana sadana (Moore), Warren, 1922, *Gross-Schmetterl.* **10**: 466.
Tridrepana adelpha matronalis Bryk, 1943, *Ark. Zool.* **34**A, No. 13: 16. (Type in Naturhistoriska Riksmuseum, Stockholm.). (SYN. NOV.)

TYPE. Holotype male, Darjeeling. Not examined. Deposited in collection of A. E. Russel which is presumed to be lost (Horn and Kahle, 1935–1937).

DESCRIPTION: MALE (Pl. 3, fig. 8). 34·9, 32·4–38·4 mm. (7). Head OOS–5–12° immediately anterior to antennae; palp, antenna and rest of head OOY–17–8°; antennal shape as for *adelpha*.

Thorax with narrow whitish anterior border; rest of thorax and abdomen OOY–17/18–12°. Shape of fore wing and venation of both wings as for *adelpha*. Ground colour of upperside of fore wing as for thorax; wing from just proximal to postmedial, to subterminal, O–17–6°; costa irrorated with greyish-brown scales. Fore wing colour pattern as for *adelpha* but with following differences: mid-cell spot and discocellular spot edged with OOS–8–6°; spot at end of cell between M_3 and Cu_1, and between Cu_1 and Cu_2 not obliquely elongate; anterior part of proximal postmedial line more strongly marked, vestige of distal postmedial line edged distally

with lunulate line of lustrous whitish scales ; anterior part of subterminal represented by continuous lunulate line, OOS/O–8–9°, edged distally, from near apex to tornus, with line of lustrous whitish scales. Ground colour of hind wing as for thorax ; trace of posterior part of antemedial ; discocellular spot sometimes well marked, dark ; small dark posterodistal spot, sometimes with whitish centre ; small dark spot usually present posterior to latter ; further spot between and near bases of Cu_1 and Cu_2 ; posterior medial spots usually with trace of surrounding greyish-brown area ; proximal postmedial line as for *adelpha* but nearly parallel to outer margin ; distal postmedial line as for *adelpha* ; subterminal absent ; wing non-lustrous. Underside of fore wing OOY–17–9° anteriorly, lighter posteriorly, irrorated with dark brown at base ; trace of antemedial ; medial spots except for mid-cell spot moderately well marked ; anterior part of distal postmedial line well marked as interneural spots ; weakly marked marginal shade along anterior part of outer margin ; other markings may show through faintly from upperside. Ground colour of hind wing as for fore wing ; trace of antemedial ; discocellular and mid-cell spot moderately well marked, other spots weakly marked ; proximal postmedial line usually well marked.

FEMALE. 37·6, 35·0–43·4 mm. (7). As for male but with following differences. Longest antennal pectination about three-quarters greatest diameter of eye. Ground colour and markings of both wings slightly lighter ; lustrous bands near outer margin of upperside of fore wing less distinctly marked, proximal band distal to distal postmedial line sometimes nearly obsolete.

GENITALIA : MALE. (Text-figs. 125, 126). Saccus very small. Valve short, with longitudinal sulcus. Anellus as for *adelpha*. Posteromedial pad of gnathus variable in size but usually broader transversely than in *adelpha*. Socius moderately long. Uncus lobes distinctly produced posterolaterally. Aedeagus slightly dilated apically ; vesica without armature. Eighth sternite similar to *adelpha*, but with posterior margin almost straight medially. Eighth tergite similar to *adelpha* but with posterior lobes less broad, not meeting medially.

FEMALE (Text-fig. 127). Bursa copulatrix without ornamentation. Ductus bursae membranous. Postostial segment without lateral lips. Ventral ovipositor lobes papillate and hairy ; dorsal lobes forming hood-like structure (cf. *finita*), but more evenly rounded marginally.

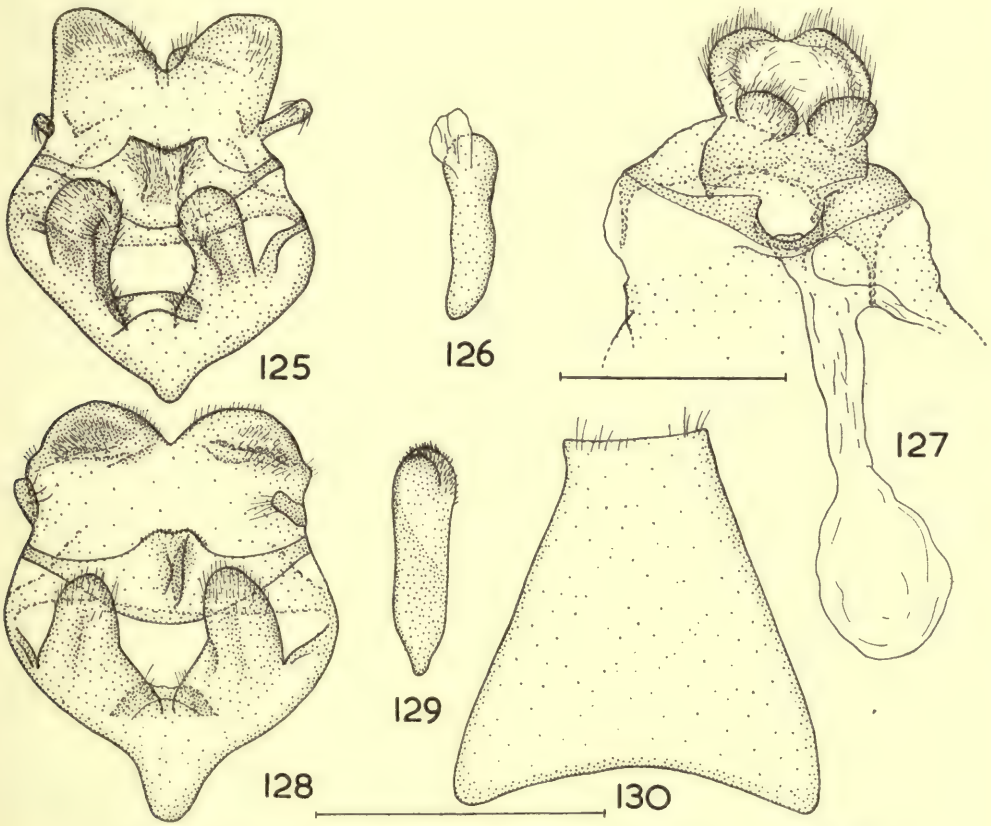
DIAGNOSIS. Distinguished from *adelpha* by the light brown ground colour of the apical part of the upperside of the fore wing, and band of whitish lustrous scales bordering posterior vestige of distal postmedial line and subterminal ; also by the almost complete absence of a shade surrounding posterior medial spots on the upperside of the hind wing.

DISCUSSION. Although the holotype has not been examined, there can be little doubt as to the identity of the species. The British Museum (Nat. Hist.) possesses a male from the Moore Collection collected in N. India and with a determination label " *Drepana sadana* " in Moore's handwriting.

DISTRIBUTION. Sikkim, N. India and N.E. Burma.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 1 ♂, 1 ♀, from type locality ; 1 ♀, Gopaldhara, Darjeeling, 3,440–5,800 ft., H. Stevens ; 1 ♂, Sikkim, Stgr.; 2 ♀, Sikkim, 31.v, 3.vii.1889, J. G. Pilcher ; 1 ♀, Sikkim, vii.1909, F. Moller ;

1 ♀, Kumaon, 28.vi.93, J. G. Pilcher ; 1 ♂, N. India, Moore Coll ; 1 ♀, Collection H. J. Elwes. NATURHISTORISKA RIKSMUSEUM, STOCKHOLM : 2 ♂, 1 ♀, N. E. Burma, Kambaiti, 7,000 ft., 10/4, 17.v.1934, R. Malaise (including holotype and allotype of *matronalis* Bryk). NATURHISTORISCHES MUSEUM, VIENNA : 1 ♂, Sikkim, Katapahar, Gebauer.



FIGS. 125 and 126. *Tridrepana sadana* (Moore), male. 125. Genitalia. 126. Aedeagus.

FIG. 127. *T. sadana* (Moore), female, genitalia.

FIGS. 128–130. *T. aurorina* Bryk, holotype male. 128. Genitalia. 129. Aedeagus. 130. Eighth tergite.

Tridrepana aurorina Bryk (stat. nov.)

Tridrepana glaciata aurorina Bryk, 1943, *Ark. Zool.* **34**A, No. 13 : 15. (fig.).

TYPE. Holotype male, N.E. Burma, Kambaiti, 7,000 ft., 5/6 R. Malaise ; Drepanidae genitalia slide no. 435 (in Naturhistoriska Riksmuseum, Stockholm).

DESCRIPTION : MALE. 34·7, 31·2–36·2 mm. (4). Palp, antenna and head posterior to antennae OOY–17/18–12° ; head between and anterior to antennae

OOS–6–12°, to OOY–17–9° above labrum. Longest antennal pectination equal to about one and two-thirds times greatest diameter of eye.

Thorax and abdomen OOY–17/18–12° above, OOY–19–11° beneath. Fore wing moderately falcate, outer margin straight; venation of both wings as for *adelpha*. Ground colour of upperside of fore wing as for thorax but irrorated with light reddish brown distally (O–14–12°); trace of antemedial, mid-cell spot and discocellular spot; whitish posterodistal spot, well marked; trace of spots posterior to latter spot between M_3 and Cu_1, and between Cu_1 and Cu_2; trace of proximal line of postmedial at costa and inner margin; indication of distal postmedial line posteriorly, edged distally with lunulate, lustrous, whitish line (cf. *sadana*); trace of subterminal, faintly edged distally with lustrous, whitish scales (cf. *sadana*); fringe from apex to Cu_2 O–3–6°, tipped with light grey. Upperside of hind wing OOY–19–10° from base to just distal to postmedial, rest of wing as for fore wing; trace of antemedial, discocellular spot and whitish posterodistal spot; posterior part of proximal postmedial line well marked, trace of posterior part of distal line; no trace of subterminal. Hind wing moderately lustrous from base to just distal to postmedial; lustrous scaling in fore wing confined to whitish bands bordering distal postmedial line and subterminal. Underside of fore wing OOY–18–12° anteriorly, slightly darker distally and basally, and lighter posteriorly; trace of discocellular spot, posterodistal spot and anterior part of distal postmedial line; indication of subterminal and marginal shade; fringe as for upperside. Hind wing OOY–17–8°; trace of discocellular spot and proximal line of postmedial.

GENITALIA: MALE (Text-figs. 128–130). Saccus small. Valve small; ventral margin of valves nearly touching each other medially at base. Anellus as for *adelpha*. Minutely spinose part of gnathus strongly evaginate medially, slightly constricted at middle. Socius moderately long. Lobes of uncus uniformly rounded posteriorly. Aedeagus not dilated apically, vesica densely spinose. Eighth sternite similar to *adelpha* but uniformly rounded, not concave laterally. Eighth tergite not bilobed posteriorly (see figure).

FEMALE. Not known.

DIAGNOSIS. Distinguished from *sadana* by the faintly marked colour pattern and the absence of any dark brown scales. In the genitalia the presence of vesical spines separates the species from *sadana*.

DISTRIBUTION. All the material examined was taken in N.E. Burma.

MATERIAL EXAMINED. NATURHISTORISKA RIKSMUSEUM, STOCKHOLM: 2 ♂ paratypes, from type locality, 7–9/6, 1934, Malaise; 1 ♂, from type locality, 8/6, R. Malaise.

Tridrepana rubromarginata rubromarginata (Leech)

Drepana rubromarginata Leech, 1898, *Trans. R. ent. Soc. Lond.* **1898**: 365.
Drepana rubromarbinata Leech, Hampson, 1910, *J. Bombay nat. Hist. Soc.* (1) **20**: 98.
Drepana rubromarginata Leech, Strand, 1911, *Gross-Schmetterl.* **2**: 201. (fig.)
Iridrepana rubromarginata (Leech), Warren, 1922, *Gross-Schmetterl.* **10**: 465.
Drepana rubromarginata Leech, Gaede, 1931, *Lepid. Cat.* **49**: 30.

TYPE. Holotype male, W. China, Pu-tsu-fong, 9,820 ft., June and July 1890, Native coll. ; Drepanidae genitalia slide no.438.

DESCRIPTION. MALE. 33·3, 31·6–34·8 mm. (4). Antenna and outer surface of palp OOY–18–11° ; longest antennal pectination twice greatest diameter of eye ; head OOY–16–10° posterior to antennae, OOS–8–6° between and anterior to antennae to OOY–18–11° above labrum.

Thorax and abdomen OOY–18–11° above, OOY–18–8° beneath. Venation of both wings as for *albonotata* but with following small differences in fore wing : R_1 sometimes from just distal to half length of areole ; R_2 from just distal to end of areole ; M_1 sometimes not stalked with R_5. Upperside of both wings as for thorax, but with fore wing darker anterior to cell and irrorated with brownish yellow distally. Costa of fore wing irrorated with darker scales as in *sadana* ; antemedial as for *adelpha*, but darker and more strongly marked ; dark mid-cell and discocellular spot ; whitish posterodistal spot edged with dark scales ; large dark spot between M_3 and Cu_1 immediately posterior to posterodistal spot and contiguous with it ; further dark spot between Cu_1 and Cu_2, less strongly marked than latter ; proximal line of postmedial as for *sadana*, but strongly lunulate especially between M_3 and Cu_2 ; distal line of postmedial well marked as broad diffuse band of OOS–6–9°, from M_1 to inner margin ; subterminal strongly marked, OOS–1–4°, from R_5 to 2A, lunulate, interrupted at veins, anterior markings indistinctly edged distally with light greyish scales ; marginal shade between subterminal and outer margin from apex to near inner margin OOS–8–6° ; fringe of outer margin from apex to near tornus as for *sadana*. Wing non-lustrous except for light grey edge to anterior subterminal markings. Hind wing similar to *sadana* but with anterior part of distal postmedial line moderately well developed as diffuse interneural spots. Ground colour of underside of both wings as for *sadana*. Fore wing with trace of antemedial and mid-cell spot ; discocellular and posterodistal spot well marked ; spot posterior to latter spot also well marked ; anterior part of distal postmedial line well marked ; anterior part of subterminal and marginal shade moderately well marked ; fringe as for upperside ; other markings show through faintly. Antemedial fascia and medial spots of hind wing as for *sadana* ; distal postmedial line well marked ; subterminal moderately well marked anterior to M_3 as diffuse interneural dashes ; other markings show through faintly.

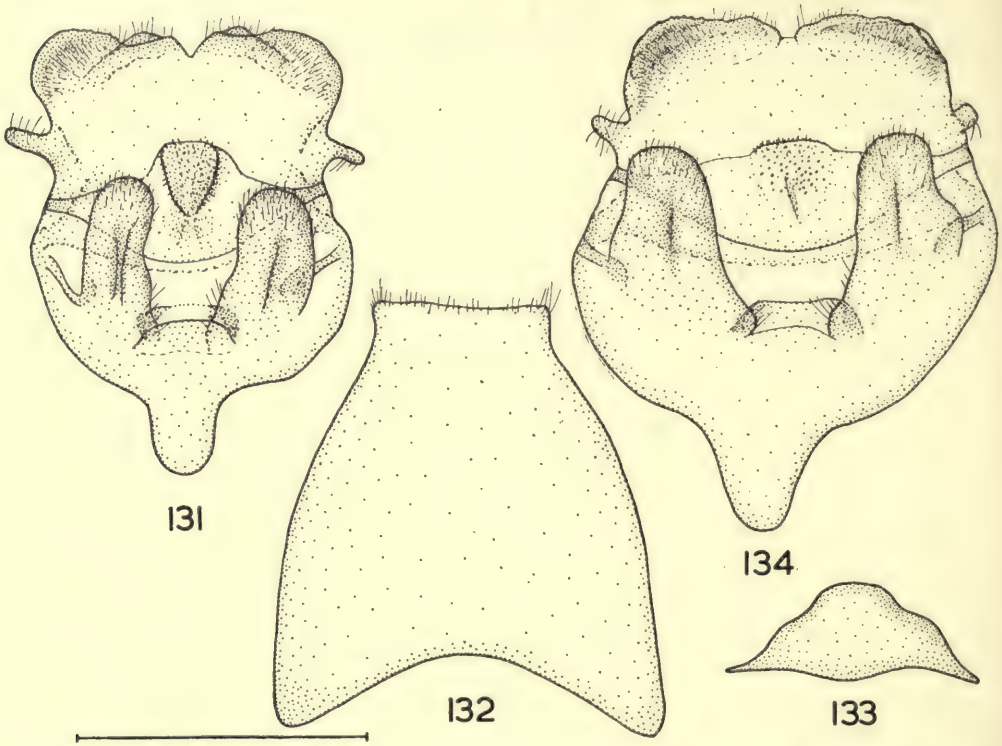
GENITALIA : MALE (Text-figs. 131–133). Saccus as for *adelpha* but more distinctly differentiated from vinculum. Valve and anellus as for *sadana*. Medial spiny part of gnathus subtriangular and strongly evaginated ; scobinate area extending anteriorly from apex of triangle. Socius small. Uncus as in figure. Aedeagus similar to *finita* but with less densely spinose vesica ; longest spine equal in length to one-third diameter at middle of aedeagus. Posterior margin of eighth sternite inflexed laterally, convex medially. Eighth tergite as in figure.

FEMALE. Not known.

DIAGNOSIS. Easily distinguished from its closest apparent relative, *sadana*, by the colour pattern of the distal half of the upperside of the fore wing and presence of a distal postmedial line from near costa to inner margin.

MATERIAL EXAMINED. ZOOLOGISCHES FORSCHUNGSINSTITUT U. MUSEUM A.

KOENIG: 3 ♂, China, Provinz Nord-Yunnan, Li-kiang, 29.vii.1935, 2, 11.viii.1935, H. Höne.



FIGS. 131–133. *Tridrepana rubromarginata rubromarginata* (Leech), holotype male. 131. Genitalia. 132. Eighth tergite. 133. Eighth sternite.
FIG. 134. *T. r. indica* ssp. n., holotype male, genitalia.

Tridrepana rubromarginata indica ssp. n.

Drepana rubromarginata Leech, Hampson, 1910, *J. Bombay nat. Hist. Soc.* (1) **20** : 98
Drepana rubromarginata Leech, Strand, 1911, *Gross-Schmetterl.* **2** : 201.
Iridrepana rubromarginata (Leech), Warren, 1922, *Gross-Schmetterl.* **10** : 465.
Tridrepana rubromarginata (Leech), Gaede, 1931, *Lepid. Cat.* **49** : 30.

TYPE. Holotype male, Sikkim, Tonglo, 10,000 ft., July 1886, H. J. Elwes; Drepanidae genitalia slide no. 440.

DESCRIPTION: MALE (Pl. 3, fig. 5). 40·9, 39·0–42·4 mm. (6). As for nominate race but with following differences. Much larger. Transverse fasciae on upperside of both wings less distinctly marked. Upperside of fore wing with large diffuse spot near base between cell and 2A, colour as for antemedial; spots posterior to posterodistal spot equally strongly marked; area between proximal and distal postmedial lines irrorated with O–11–12°. Hind wing with more strongly marked medial spots. Underside of fore wing with dark spot posterior to posterodistal

spot larger ; no trace of postmedial ; subterminal fascia and marginal shade weakly marked. Hind wing with no trace of postmedial or subterminal.

GENITALIA : MALE (Text-fig. 134). As for nominate race but with following differences : shape of saccus as for *adelpha* ; posterior part of gnathus less strongly evaginated, with shorter spines, and without scobinate area anteriorly ; uncus differently shaped.

FEMALE. Not known.

DIAGNOSIS. Separated from the nominate race by the size, the less distinctly marked transverse fasciae on the upperside of the fore wing, the more strongly marked medial spots and the dark spot proximal to the antemedial fascia.

DISTRIBUTION. Sikkim, Bhutan and Nepal.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 1 ♂ paratype, with same data as holotype ; 1 ♂ paratype, Bhutan ; 2 ♂ paratypes, – – – – – of Nepaul, Phallalong, 12,000 ft., July 1905.

Tridrepana thermopasta (Hampson) (comb. nov.)

Drepana thermopasta Hampson, 1914, *Ann. Mag. nat. Hist.* (8) **14** : 106.
Drepana thermopasta Hampson, Gaede, 1932, *Gross-Schmetterl. Suppl.* **2** : 168.

TYPE. Holotype male, W. China, Leech Coll.; Drepanidae genitalia slide no. 305.

DESCRIPTION : MALE (Pl. 3, fig. 9). 14·7 mm. (1). (Much of the scaling badly worn and coloration therefore sometimes doubtful.) Antenna, palp and head posterior to antennae OOY–16–11° ; head between and immediately anterior to antennae O–4–10°. Longest antennal pectination equal to just over twice greatest diameter of eye.

Colour of thorax and abdomen doubtful. Ground colour of upperside of fore wing OOY–16–10°, conspicuously irrorated with O–7–11° ; trace of antemedial, discocellular spot, posterior part of postmedial, and more distinct trace of anterior part of subterminal. Hind wing ground colour as for fore wing, but less heavily irrorated with dark scales posteriorly and without such irroration anteriorly ; trace of posterior parts of antemedial, proximal and distal postmedial lines, and subterminal. Underside of both wings O–18–12° ; fore wing with trace of anterior part of postmedial (probably distal line) and subterminal ; hind wing unmarked. Wings entirely non-lustrous.

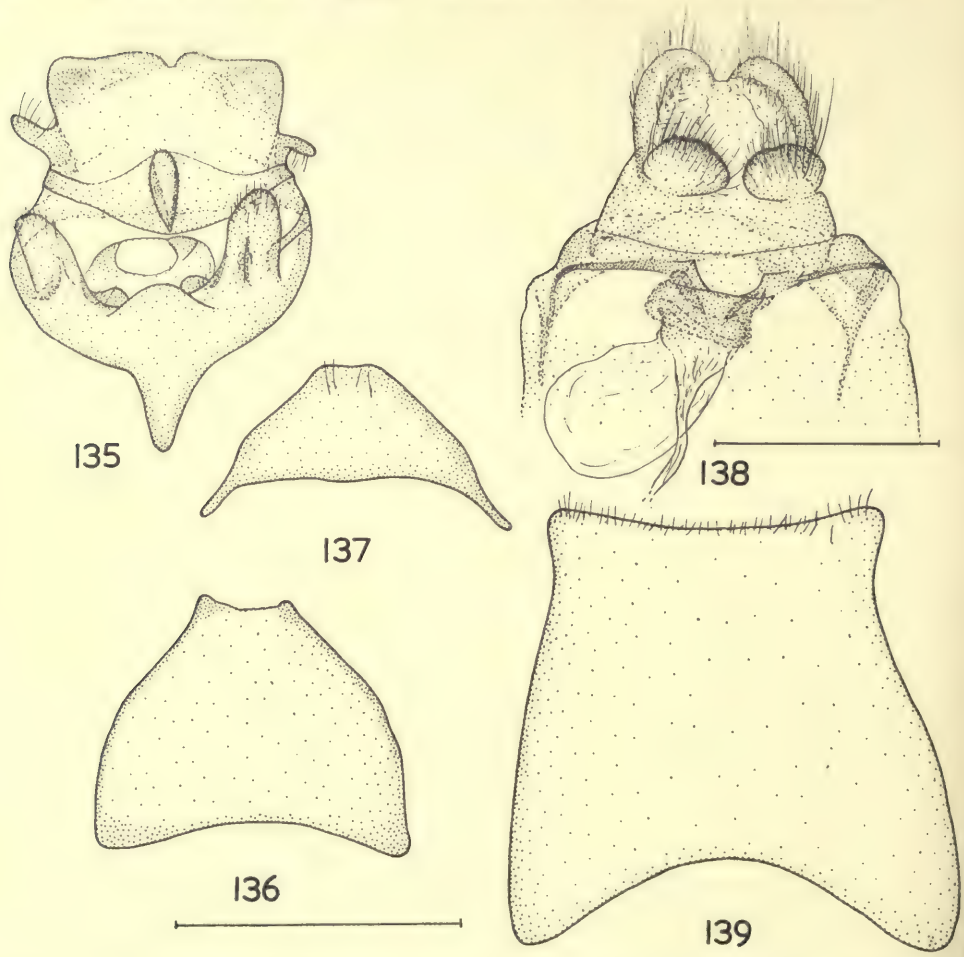
GENITALIA : MALE (Text-figs. 135, 136). As for *rubromarginata rubromarginata* but with saccus tapered, bluntly pointed ; medial part of gnathus minutely spinose, elongate, strongly evaginate ; medial bulge of each lobe of uncus small or absent ; and eighth tergite much shorter (see figure).

FEMALE. Not known.

DIAGNOSIS. Distinguished from the rest of the species group by the irroration of dark scales on the upperside of the wings.

DISTRIBUTION. W. China.

No material other than the holotype was examined.



FIGS. 135 and 136. *Tridrepana thermopasta* (Hampson), holotype male. 135. Genitalia. 136. Eighth tergite.

FIG. 137. *T. maculosa* sp. n., holotype male, eighth sternite.

FIG. 138. *T. fulva* (Hampson), female, genitalia.

FIG. 139. *T. fulva* (Hampson), holotype male, eighth tergite.

Tridrepana maculosa sp. n.

TYPE. Holotype male, China, Provinz Nord-Yuennan, Li-Kiang, 10.vii.1935, H. Höne; Drepanidae genitalia slide no. 442. (in Zoologisches Forschungsinstitut und Museum A. Koenig, Bonn).

DESCRIPTION: MALE (Pl. 3, fig. 10). 43·5, 38·8–46·4 mm. (16). Palp, antenna and head posterior to antennae O–17–10°; head between and anterior to antennae OOS–9–11° to O–15–11° above labrum. Longest antennal pectination equal to twice greatest diameter of eye.

Thorax and abdomen OOY–18–11° above, much lighter beneath. Fore wing weakly falcate, outer margin straight ; venation as for *albonotata* but with R_1 usually from two-thirds areole. Ground colour of both wings as for thorax. Upperside of fore wing and hind wing with all markings proximal to subterminal nearly concolorous, OOS–9/10–2°, except for posterodistal spot. Fore wing with antemedial well marked, interrupted at veins ; mid-cell and discocellular spot large, of equal size ; light grey posterodistal spot, edged with dark scales ; large spot posterior to latter spot and confluent with dark edge of latter, and dark spot near cell between Cu_1 and Cu_2; (latter two spots variable in size) ; proximal postmedial line from just over one-third costa to just over one-half inner margin, interrupted at veins, lunulate posterior to M_3 ; distal postmedial line broader, more strongly lunulate, diverging from proximal line terminally : subterminal consisting of well marked interneural dashes, most strongly marked anteriorly, marking between M_1 and M_2 enlarged ; marginal shade between apex and M_3 OOS/O–13–7°, fringe bordering shade dark grey tipped with whitish. Hind wing with antemedial well marked, interrupted at veins ; mid-cell spot absent, remaining medial spots as for fore wing ; postmedial lines as for fore wing but less distinctly lunulate ; subterminal similar to posterior part of fascia in fore wing, marking between M_1 and M_2 largest. Upperside of both wings non-lustrous or very slightly lustrous. Underside of both wings OOY–18–9°. Fore wing slightly darker anteriorly and irrorated with OOS–9–12° proximally ; discocellular spot well marked, posterodistal spot and spot between M_3 and Cu_2 sometimes present ; trace of anterior part of distal postmedial line ; subterminal well marked from apex to M_3 ; marginal shade and fringe as for upperside ; wing slightly lustrous anteriorly. Hind wing with discocellular spot well marked ; trace of proximal postmedial line and of subterminal from R_5 to M_3 ; other markings show through faintly as in fore wing ; wing slightly lustrous.

FEMALE. 47·3, 45·6–48·2 mm. (6). As for male but with longest antennal pectination equal to greatest diameter of eye.

GENITALIA. As for *finita* but with following differences.

MALE. (Fig. 137). Medial spinose part of gnathus only slightly evaginate ; eighth sternite differently shaped, slightly concave posteriorly.

FEMALE. Dorsal ovipositor lobes more evenly rounded as in *sadana*.

DIAGNOSIS. The combination of the macular colour pattern and the presence of a well developed distal postmedial line and subterminal fascia in both wings distinguishes the species from the rest of the species group.

DISTRIBUTION. W. China.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 1 ♂ paratype, W. China, Tay-Tou-Ho, 1896. ZOOL. FORSCHUNGSINSTITUT U. MUS. A. KOENIG, BONN : allotype ♀, from type locality, 30·vi.1935, H. Höne, Drepanidae genitalia slide no. 449; 12 ♂, 5 ♀ paratypes, from type locality, 21–28.vi, 1–5.vii, 6.viii.1935, H. Höne ; 2 ♂ paratypes, Nord-Yünnan, A-tun-tse, ca. 3,000 m., 1, 3.vii.1937, H. Höne.

Tridrepana fulva (Hampson)

Drepana fulva Hampson, 1893, *Fauna Brit. India Moths* **1** : 342.
Drepana fulva Hampson, Dudgeon, 1899, *J. Bombay nat. Hist. Soc.* (4) **12** : 655.

Iridrepana fulva (Hampson), Warren, 1922, *Gross-Schmetterl.* **10** : 466.
Tridrepana fulva (Hampson), Gaede, 1931, *Lepid. Cat.* **49** : 29.

TYPE. Holotype male, Sikkim, 13,000 ft., 1887 : Drepanidae genitalia slide no. 446.

DESCRIPTION : MALE (Pl. 3, fig. 12). 43·5, 42·8–44·2 mm. (5). Palp, antenna and head posterior to antennae O–13–11° ; head between and anterior to antennae OOS–8–11°, to OOY–19–12° above labrum. Longest antennal pectination equal to two and a half times greatest diameter of eye.

Venation of both wings as for *albonotata*. Fore wing slightly falcate, outer margin straight. Upperside of both wings O/OOY–16–12° ; markings weakly and diffusely marked, only slightly darker in colour than ground colour ; colour pattern probably similar to *maculosa* but with no trace of subterminal ; slightly lustrous. Underside of both wings OOY–17/18–10°, but fore wing darker anteriorly and irrorated with O–6–4° proximally ; faint trace of colour pattern in some specimens ; slightly lustrous. Colour of thorax and abdomen doubtful.

FEMALE. 46·4, 46·0–46·8 mm. (2). As for male but with longest antennal pectination equal to just less than greatest diameter of eye.

GENITALIA. As for *finita* but with following differences.

MALE. (Text-fig. 139). Vesica of aedeagus less densely spinose, as in *rubromarginata*; eighth tergite much broader posteriorly.

FEMALE. (Text-fig. 138). Lateral lips of postostial segment reduced in size ; ovipositor lobes differently shaped.

DIAGNOSIS. Distinguished from *maculosa* by the dull orange-yellow colour of the upperside of both wings, and the diffusely marked colour pattern.

DISTRIBUTION. Sikkim, E. Tibet.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.) : 1 ♀, Sikkim ; 1 ♂, Sikkim, Yatong, 1894, Bingham ; 1 ♀, Sikkim, vii.1909, F. Moller ; 1 ♂, 1 ♀, Sikkim, Knyvett ; 2 ♂, E. Tibet, Chumbi, Moore Coll.

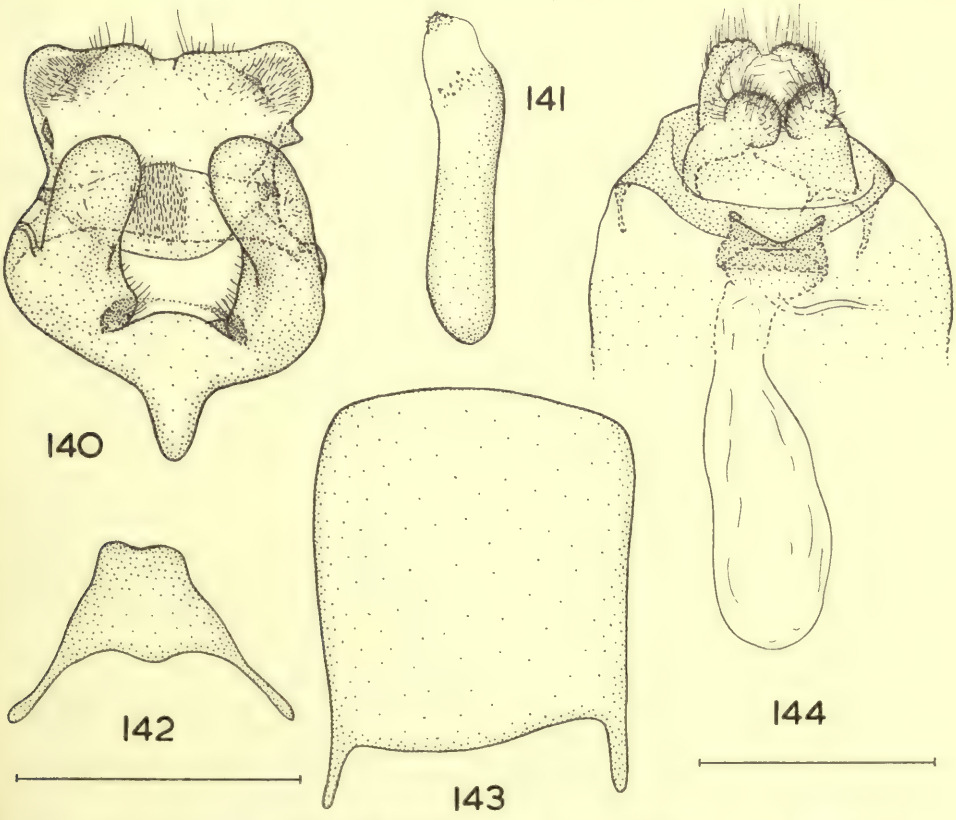
Tridrepana marginata sp. n.

TYPE. Holotype male, China, Provinz Nord-Yuennan, Li-kiang, 13.ix.1934, H. Höne ; Drepanidae genitalia slide no. 451. (in Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn).

DESCRIPTION : MALE (Pl. 3, fig. 11). 28·6, 27·0–32·2 mm. (26). Palp, antenna and head between and posterior to antennae OY–19–12° ; head anterior to antennae OOS–8–5°, to OOY–18–10° above labrum. Longest antennal pectination just longer than greatest diameter of eye.

Upperside of thorax and abdomen OOY/OY–19–12° above, OY–19–10° beneath. Fore wing moderately falcate, outer margin slightly convex ; frenulum distinctly clavate. Venation as for *albonotata* but fore wing with R_1 usually from two-thirds length of areole. Ground colour of fore wing as for thorax but darker near outer margin ; proximal quarter of costa irrorated with dark grey ; trace of antemedial, terminating in dark costal spot, O–6–2° ; minute, whitish mid-cell spot, finely edged with darker scales ; trace of discocellular spot ; large, usually triangular, grey

(OOS–13–2°) spot at end of cell at base of M_3, and similar but ovate spot at base of Cu_1, both edged with darker scales, closely apposed to each other; finely marked proximal postmedial line from two-thirds inner margin, slightly lunulate, terminating in dark costal spot as for antemedial; trace of broad, diffuse distal postmedial line posterior to M_1; subterminal of interneural dashes, usually very faintly marked posteriorly, strongly marked between apex and M_3, edged distally with light grey; whole of fringe of outer margin dark brown, tipped with whitish anteriorly; wing moderately lustrous except for band between subterminal and distal postmedial line and small apical area. Hind wing OY–19–11°; trace of antemedial, discocellular spot and posterodistal spot; proximal postmedial line faintly marked as interneural spots; trace of subterminal in some specimens; fringe of outer margin as for rest of wing anteriorly, dark brown for short distance near tornus; wing moderately lustrous. Underside of both wings OY–19–11°, fore wing slightly darker anteriorly and lightly irrorated with dark scales proximally. Fore wing with trace of antemedial and mid-cell spot; discocellular spot, posterodistal spot and



FIGS. 140–143. *Tridrepana marginata* sp. n., holotype male. 140. Genitalia. 141. Aedeagus. 142. Eighth sternite. 143. Eighth tergite.

FIG. 144. *T. marginata* sp. n., female, genitalia.

anterior part of distal postmedial line and subterminal moderately well marked; fringe as for upperside. Hind wing with discocellular spot, posterodistal spot and proximal postmedial line moderately well marked; trace of subterminal posterior to M_1, most distinctly marked between M_1 and M_2. Degree of lustre as for upperside.

FEMALE. 33·0, 30·2–39·0 mm. (12). As for male, but longest antennal pectination just shorter than greatest diameter of eye, and whole of upperside of fore wing lustrous.

GENITALIA: MALE (Text-figs. 140–143). Saccus small, tapered. Valve small, slightly arcuate; outer surface with very shallow, longitudinal sulcus. Anellus as for *adelpha*. Shape of gnathus similar to *adelpha*; medial pad quadrate, slightly evaginate, clothed with short, posteriorly directed spines. Socius short, pointed. Uncus bilobed, slightly produced laterally. Aedeagus slightly dilated apically; vesica with nearly complete ring of short spines at base, and small cornutus distally. Eighth sternite with well developed apodemes (ct. rest of species group). Eighth tergite nearly square.

FEMALE. (Text-fig. 144). Bursa copulatrix without ornamentation. Ductus bursae short, posterior part sclerotized. Ventral ovipositor lobes hairy, closely apposed to each other medially; dorsal lobes separated by small invagination posteromedially. Ostial segment well developed dorsally, with slightly raised longitudinal area medially.

DIAGNOSIS. Distinguished from the rest of the species group by the colour pattern of the upperside, and in the male by the clavate frenulum. The whitish centred mid-cell spot, the dark costal spot at the anterior end of the medial fascia, the completely dark outer margin fringe in the fore wing, and the partially dark outer margin fringe in the hind wing are especially distinctive.

DISTRIBUTION. W. China.

MATERIAL EXAMINED. ZOOL. FORSCHUNGSINST. U. MUS. A. KOENIG, BONN: allotype ♀, from type locality, 21.vi.1935. H. Höne, Drepanidae genitalia slide no. 467; 24 ♂, 7 ♀ paratypes, from type locality, 11–12.vi, 3–13.ix.1934, 4–29.v, 3–30.vi, 13–27.ix.1935, H. Höne. BRITISH MUSEUM (NAT. HIST.): 1 ♀ paratype, W. China, Tse Kou, 1903, P. Dubernard.

Species group *flava* Moore

This group contains a single polytypic species. The most obvious character distinguishing this species from the remaining groups is the presence of two pairs of spurs on the hind tibia.

Tridrepana flava flava (Moore)

Drepana flava Moore, 1879, *Descr. Lepid. Ath.*, p. 84.
Drepana flava Moore, Cotes and Swinhoe, 1887, *Cat. Moths. India*, p. 184.
Drepana flava Moore, Hampson, 1893, *Faun. Brit. India Moths* **1**: 340.
Albara flava (Moore), Kirby, 1892, *Syn. Cat. Lep. Het.* p. 734.
Callidrepana flava (Moore), Swinhoe, 1895, *Trans. R. ent. Soc. Lond.* **1895**: 3.
Drepana flava Moore, Dudgeon, 1899, *J. Bombay nat. Hist. Soc.* (4), **12**: 655.
Iridrepana flava (Moore), Warren, 1922, *Gross-Schmetterl.* **10**: 466.
Tridrepana flava (Moore), Gaede, 1931, *Lepid. Cat.* **49**: 29.

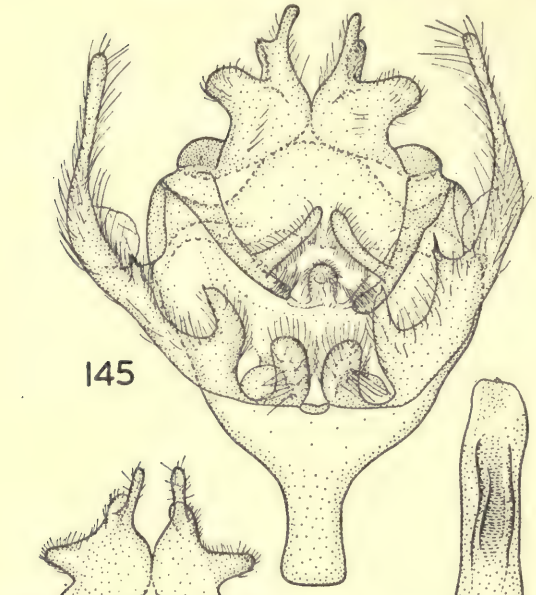
TYPE. Holotype male, Darjeeling (in Zoologisches Museum der Humboldt-Universität, Berlin).

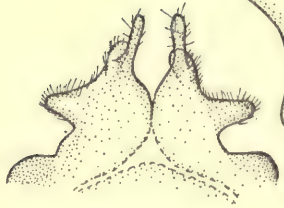
DESCRIPTION : MALE. (Pl. 3, fig. 13). 48·9, 43·0–54·0 mm. (12). Palp OOY–18/19–12°. Proximal inner pectinations of antenna and inner surface of shaft OOY–17/18–12°, rest of antenna O–6–4° ; longest antennal pectination equal to greatest diameter of eye. Head between and posterior to antennae OOY–17/18–12° ; head anterior to antennae OOS/O–5–12°, to OOY–18/19–12°.

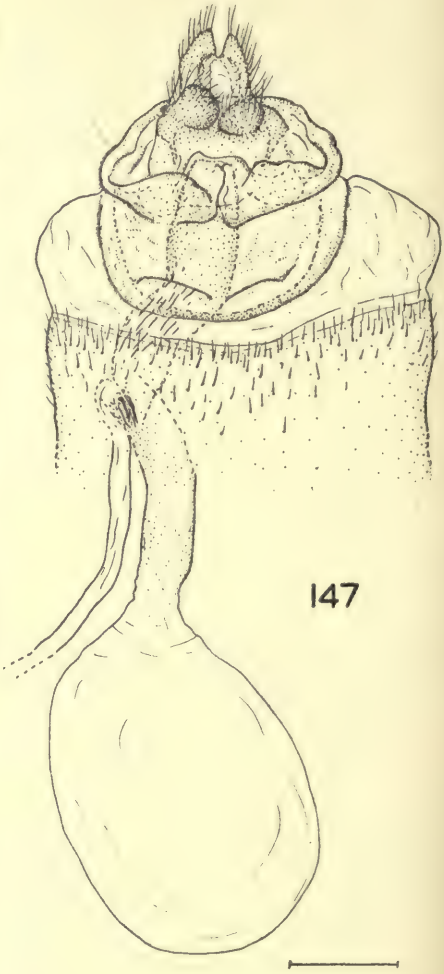
Thorax with narrow whitish anterior border, rest of thorax and abdomen OY–18/19–12° above, OOY–18–8° beneath. Shape of wings as in figure ; venation as for *albonotata*, but fore wing with R_1 free from cell not areole. Ground colour of upperside of both wings as for thorax proximally, slightly darker (OY–18–12) distally ; all markings dark brown (with exceptions mentioned below). Fore wing with trace of antemedial from one-fifth costa to one-third inner margin, lunulate ; small discocellular spot and whitish posterodistal spot ; weakly marked, irregularly shaped ring at end of cell extending to just beyond Cu_1 posteriorly and enclosing posterodistal spot anteriorly ; proximal postmedial line from two-thirds costa to one-third inner margin, strongly marked and lunulate posterior to M_2 (lunulae convex distally) ; distal postmedial line diffusely and weakly marked, lunulate between M_2 and Cu_2 (lunulae convex proximally), terminating in conspicuous costal patch ; subterminal well marked as broad, interneural dashes posteriorly, and represented by small, white, crescent-shaped markings anteriorly ; anterior part of outer margin fringe greenish yellow. Markings of underside show through fore wing. Wing lustrous except for area distal to proximal postmedial line posterior to M_3, and distal to subterminal anterior to M_3, most distinctly lustrous distally. Hind wing with trace of antemedial ; minute discocellular spot and large posterodistal spot ; proximal postmedial line from two-thirds costa to two-thirds inner margin, lunulate and interrupted at veins ; distal postmedial line nearly parallel to proximal line, not lunulate and less strongly marked ; subterminal similar in shape to distal postmedial line and nearly parallel to it. Proximal half of hind wing lustrous. Underside of both wings OY/YYO–18–11°. Fore wing with very strongly marked, broad antemedial (O–5–7°) ; small discocellular spot and trace of posterodistal spot and anterior part of distal postmedial line ; broad band of O–5–7° extending from apex to posterior end of proximal postmedial line, partially interrupted at middle ; other markings show through from upperside. Hind wing with medial spots as for upperside, but slightly lighter, and with markings of distal postmedial line anterior to R_5 ; other markings show through from upperside. Both wings slightly lustrous beneath.

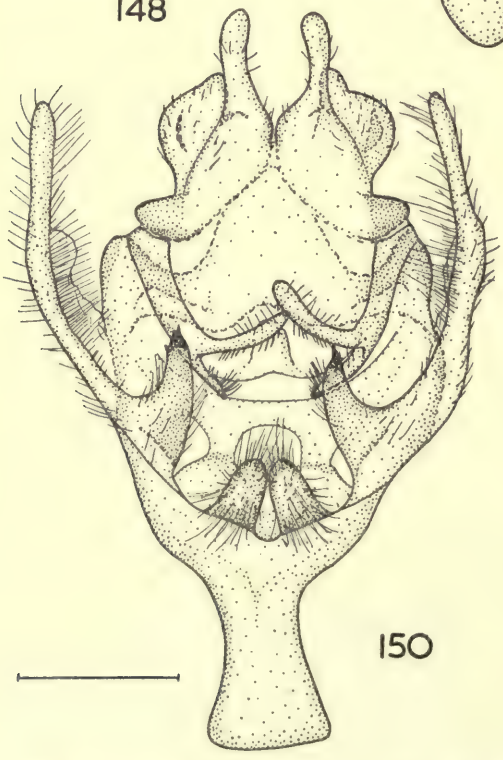
FEMALE. 54·4, 54·0–54·8 mm. (2). As for male but with longest antennal pectination equal to three-quarters greatest diameter of eye.

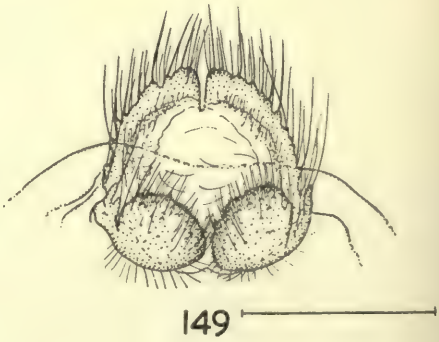
GENITALIA : MALE (Text-figs. 145, 146, 151). Saccus moderately long, slightly constricted at middle, truncate. Valves nearly touching each other medially ; each valve long, tapering and arcuate ; ventral margin with proximal lobe, and two further, apically toothed processes ; dorsal margin with membranous sac near base. Anellus most heavily sclerotized laterally, extending posterolaterally on either side. Medial pad of gnathus covered with short, hair-like spines ; lateral arms narrow,











FIGS. 145 and 146. *Tridrepana flava flava* (Moore), male. 145. Genitalia. 146. Aedeagus. FIG. 147. *T. flava flava* (Moore), female, genitalia. FIG. 148. *T. f. contracta* ssp. n., holotype male, uncus. FIG. 149. *T. f. contracta* ssp. n., female, ovipositor lobes. FIG. 150. *T. f. unita* ssp. n., holotype male, genitalia.

Socius large, bifurcate; anterior arm spatulate and truncate; posterior arm spatulate. Uncus with heavily sclerotized, anterolateral bulge on either side; bifurcate posteriorly into pair of posterior arms and pair of lateral lobes. Aedeagus with inner cornutus but without outer cornutus; vesica minutely scobinate. Eighth sternite peculiarly shaped (see figure); posteromedial hairy part curved dorsally posterior to transverse carina. Eighth tergite well developed, quadrate, just longer than least transverse width; slightly wider posteriorly than anteriorly; posterior margin hairy and slightly produced at corners; apodemes equal to half least width of tergite.

FEMALE (Text-fig. 147). Bursa copulatrix without ornamentation. Ductus bursae minutely scobinate anteriorly, rimose for some distance anterior to junction with spermathecal duct. Ostium with medially apposed lateral lips. Spermatheca with radial ornamentation. Relative lengths of ductus bursae and spermathecal duct as for *crocea*. Ostial segment minutely spinose and strongly folded ventrally; strongly developed dorsally and produced for some distance over dorsal ovipositor lobes. Ventral ovipositor lobes papillate and hairy; dorsal lobes united anteriorly, separated from each other posteriorly by deep medial emargination.

DIAGNOSIS. Readily distinguished from the remaining species of the genus by the presence of two pairs of spurs on the hind tibia.

DISCUSSION. Although quite distinct from the rest of the genus in certain features of the colour pattern, the male genitalia, and by the presence of two pairs of hind tibial spurs, many other characters including the form of the female genitalia, and other features of the colour pattern and male genitalia indicate the close affinity between *flava* and the remaining species of *Tridrepana*.

DISTRIBUTION. Sikkim and N.E. India.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): 1 ♀, from type locality; 1 ♂, Sikkim, 19.v.1888, O. Moller; 1 ♂, Sikkim; 10 ♂, Khasis, March 1894, Oct., Nov.1895, Nat. Coll; 1 ♂, Assam, Cherrapunji; 1 ♂, India. ZOOL. MUS. D. HUMBOLDT UNIVERSITÄT, BERLIN: 1 ♂, Darjeeling. MUS. NAT. D'HIST. NAT, PARIS: 1 ♂, Khasis, Nat. Coll.

Tridrepana flava contracta ssp. n.

TYPE. Holotype male, Malay States, Bukit Kutu, 3,300 ft., A. R. Sanderson; Drepanidae genitalia slide no. 461.

DESCRIPTION: MALE. 49·6, 45·6–52·2 mm. (7). FEMALE. 62·3, 58·4–66·4 mm. (3). Both sexes as for corresponding sexes of nominate race but with proximal postmedial line on upperside of fore wing less strongly lunulate, nearly straight in some specimens.

GENITALIA. As for nominate race but with following differences.

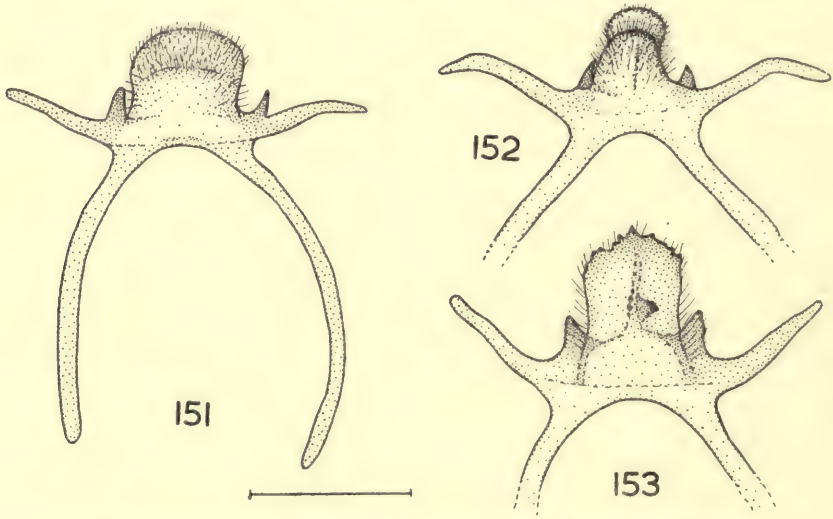
MALE (Text-figs. 148, 152). Saccus more sharply constricted (as for *unita*). Posterior lateral lobes of uncus smaller, tapered. Posterior part of eighth sternite narrower, constricted at middle.

FEMALE (Text-fig. 149). Dorsal ovipositor lobes separated by deeper medial emargination; each lobe more elongate.

DIAGNOSIS. Distinguished from the nominate race by the genitalic characters given above.

DISTRIBUTION. Malaya, Sumatra, Borneo and Java.

MATERIAL EXAMINED. BRITISH MUSEUM (NAT. HIST.): allotype ♀, from type locality, at light, 3,500 ft., 21.iii.1931, H. M. Pendlebury; 2 ♂ paratypes, with same data as holotype; 6 ♂ paratypes, from type locality, April 14., 1926, 22.iii.31, Sept.21, 22, 30.1932, H. M. Pendlebury; 1 ♂, Kedah Peak, 3,200 ft., Dec.1915; 1 ♂ paratype, Sumatra, Lebong Tandai, 22.xii.1921, C. J. Brooks; 1 ♂ paratype, S.W. Sumatra, North Korintji Valley, 5,000 ft., Sept.–Oct. 1921, C., F., and J. Pratt; 1 ♀ paratype, Slopes of Mt. Korintji, 7,300 ft., Aug.–Sept. 1921, C., F., and J. Pratt; 1 ♂, 1 ♀ paratype, S.E. Borneo, Samarinda, x.1938, M. E. Walsh; 1 ♂ paratype, B. N. Borneo, Mt. Kinabalu, Marei, Parei, 5,000 ft., 29.iv.1929; 1 ♀ paratype, Java, Mt. Gedeh, 4,000 ft., 25.x–2.xi.'24, G. Overdijink; 1 ♂, Mt. Gedeh, Aug. 1926.



FIGS. 151–153. *Tridrepana flava* (Moore), male, eighth sternite.
151. *T. flava flava* (Moore). 152. *T. flava contracta* ssp. n. 153. *T. flava unita* ssp. n.

Tridrepana flava unita ssp. n.

TYPE. Holotype male, N. Celebes, Minahassa, 1922, Coll. P. J. v. d. Bergh Lzn.; Drepanidae genitalia slide no. 469.

DESCRIPTION: MALE. 51·2 (1). As for *contracta* but with only trace of dark ring at end of cell on upperside of fore wing.

GENITALIA: MALE (Text-figs. 150, 153). As for nominate race but with following differences. Saccus more sharply constricted (as for *contracta*). Valve without toothed distal process. Posterior arms of uncus stouter, and posterolateral lobe on each side united with bulge at base of posterior arms. Eighth sternite without transverse ventral carina; strongly carinate dorsomedially; posterior margin irregularly dentate.

FEMALE. Not known.

DIAGNOSIS. Readily distinguished from the other races by the genitalic characters given above.

MATERIAL EXAMINED. ZOOL. MUS., AMSTERDAM: 1 ♂ paratype, (N. Celebes), Bolong Mongondow, 1921, Coll. P. J. v. d. Bergh Lzn.

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WARREN, 1896. New species of Drepanulidae (etc.) in Tring Museum. *Novit. zool.* **3** : 339-340.

—— 1897. New genera and species of moths from the Old-World regions in the Tring Museum. *Novit. zool.* **4** : 18.

—— 1903. New Uraniidae, Drepanulidae and Geometridae from British New Guinea. *Novit. zool.* **10** : 346.

—— 1922. The Indo-Australian Bombyces and Sphinges. *Gross-Schmetterl.* **10** : 464–467, pl. 49, figs. *a–f.*

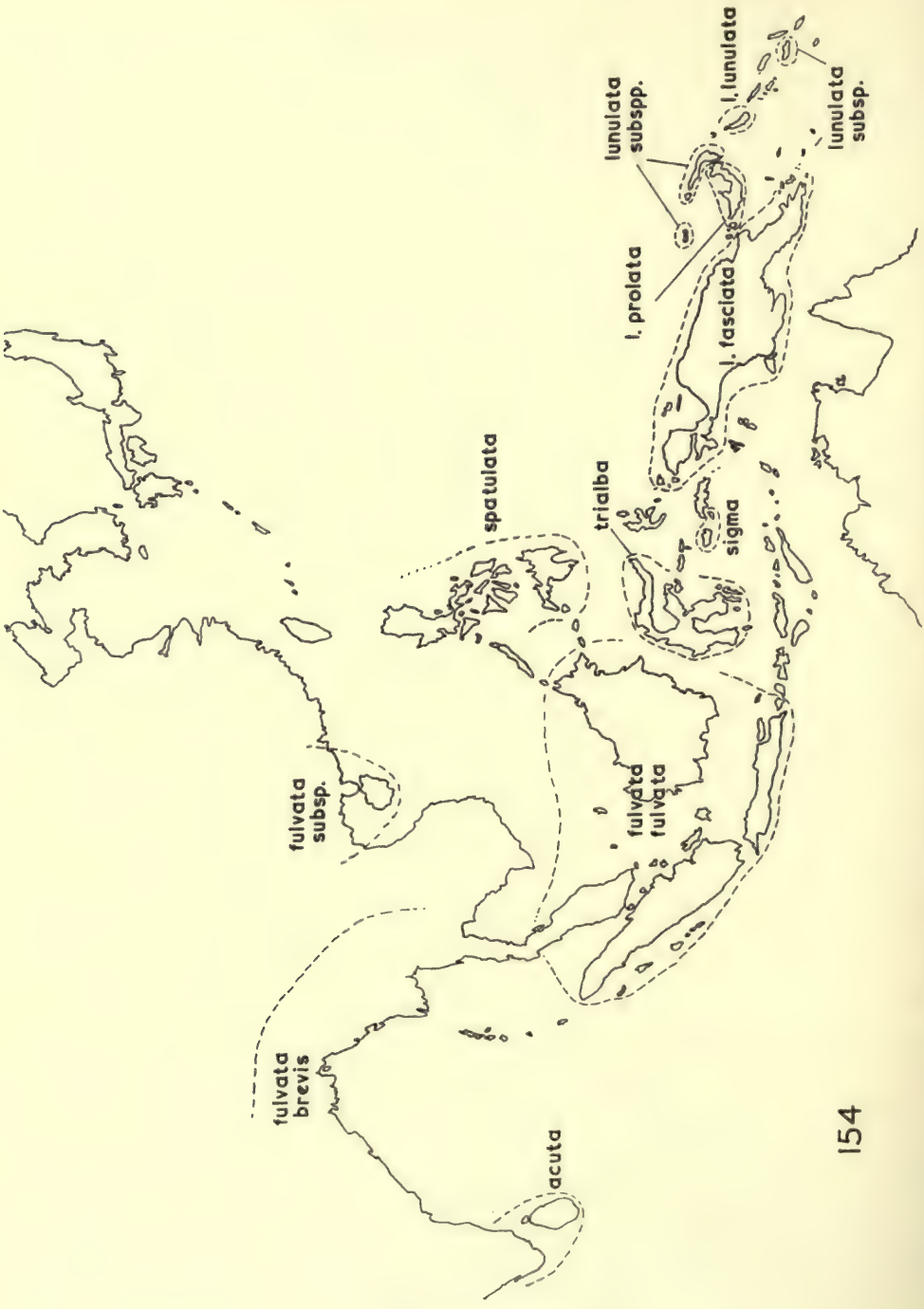

FIG. 154. Distribution of part of the *fulvata* Snellen species group.

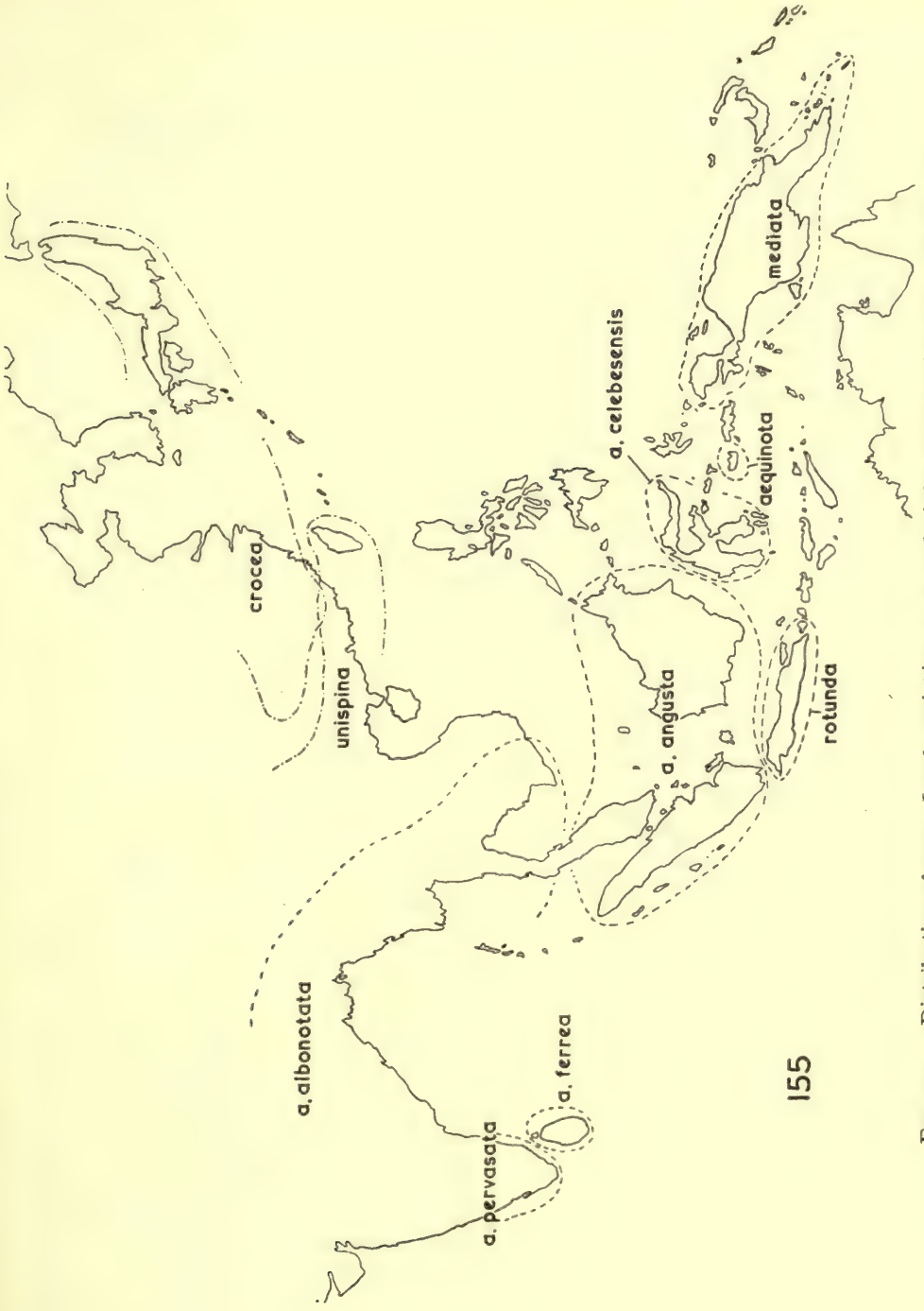

FIG. 155. Distribution of *crocea* Leech, *unispina* sp. n. and of the superspecies *albonotata* Moore.

PLATE 2

EXPLANATION OF PLATE

FIG. 1. *Tridrepana lunulata prolata* ssp. n., holotype ♂.
Fig. 2. *Tridrepana lunulata fasciata* Warren, syntype ♀.
FIG. 3. *Tridrepana sigma* sp. n., holotype ♂.
FIG. 4. *Tridrepana trialba* sp. n., holotype ♂.
FIG. 5. *Tridrepana arikana arikana* (Matsumura), ♂.
FIG. 6. *Tridrepana albonotata celebesensis* ssp. n., holotype ♂.
FIG. 7. *Tridrepana albonotata celebesensis* ssp. n., allotype ♀.
FIG. 8. *Tridrepana aequinota* sp. n., holotype ♂.
FIG. 9. *Tridrepana obscura* sp. n. holotype ♂.
FIG. 10. *Tridrepana microcrocea* Gaede, ♀.
FIG. 11. *Tridrepana sera* (Warren), ♂.
FIG. 12. *Tridrepana crocea* (Leech), ♂.
FIG. 13. *Tridrepana olivacea* Warren, (holotype ♂ of *T. semirufa* Warren).
FIG. 14. *Tridrepana examplata* Warren, ♂.
FIG. 15. *Tridrepana subtusmaculata* Gaede, ♂.
FIG. 16. *Tridrepana examplata*, syntype ♀.
FIG. 17. *Tridrepana septempunctata septempunctata* Warren, holotype ♂.

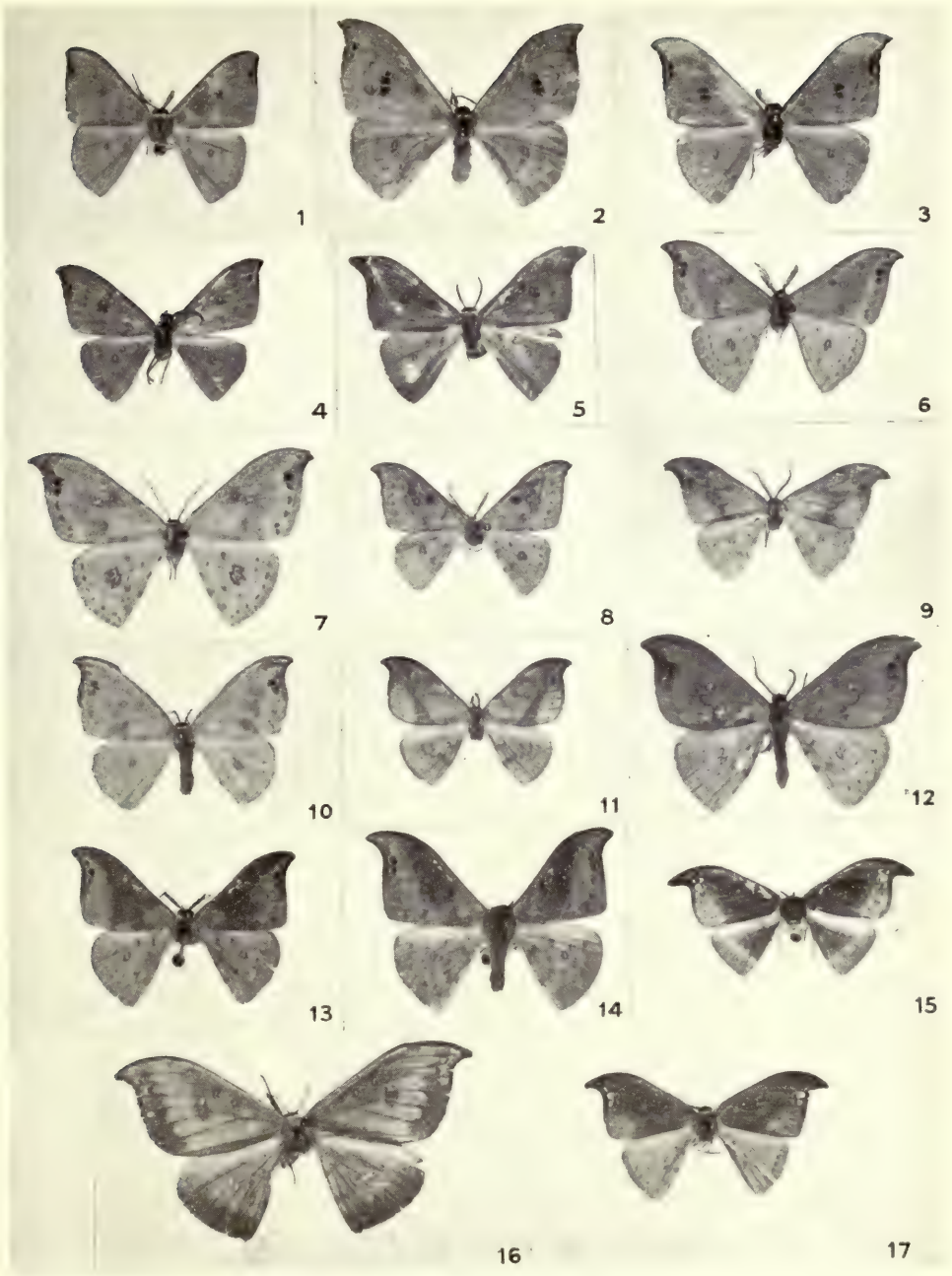
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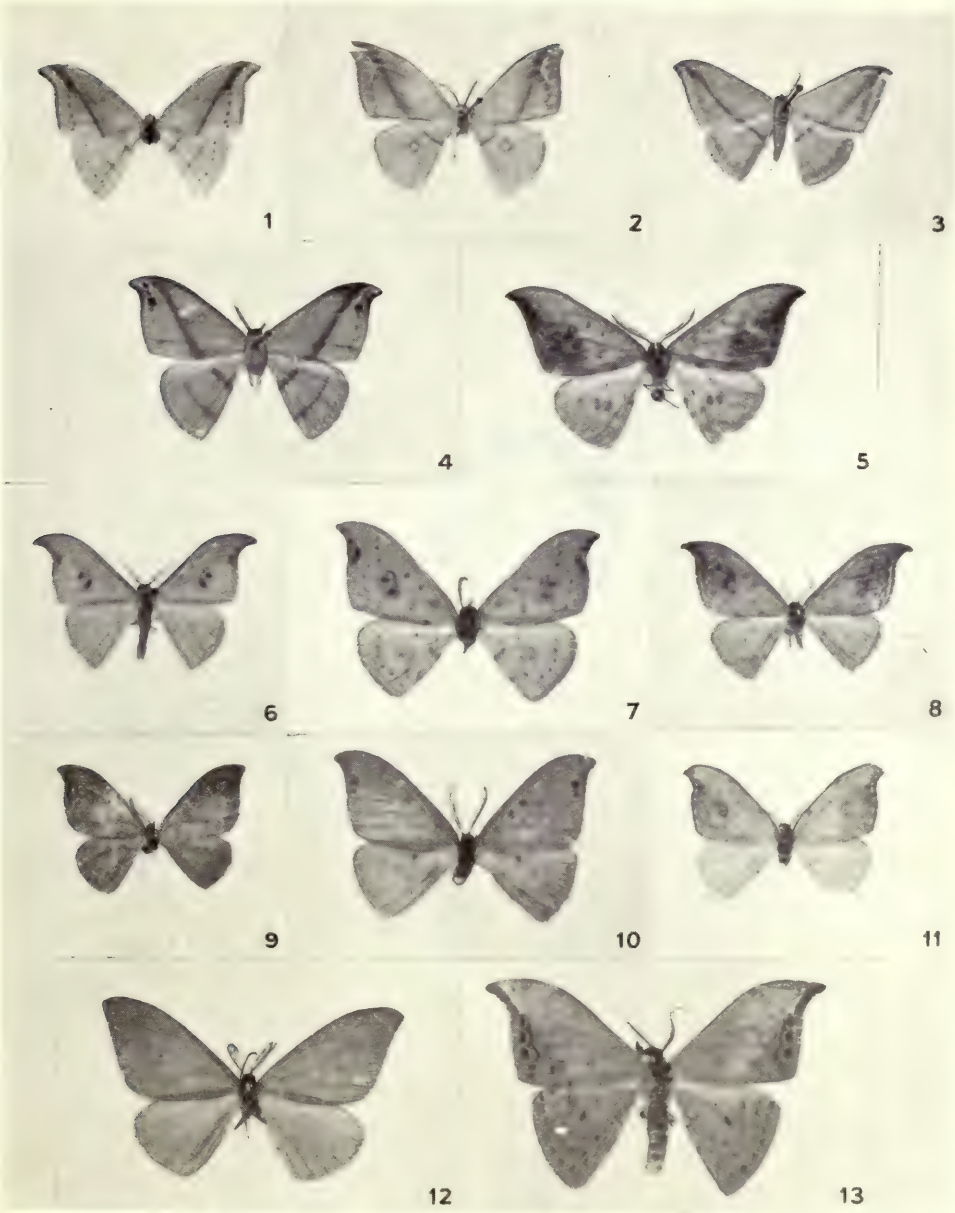
PLATE 3

EXPLANATION OF PLATE

FIG. 1. *Tridrepana postica* (Moore), holotype ♂.
FIG. 2. *Tridrepana argentistriga argentistriga* Warren, holotype ♀.
FIG. 3. *Tridrepana argentistriga brevilinea* ssp. n., holotype ♂.
FIG. 4. *Tridrepana rectifascia* sp. n., holotype ♂.
FIG. 5. *Tridrepana rubromarginata indica* ssp. n., holotype ♂.
FIG. 6. *Tridrepana adelpha* Swinhoe, holotype ♂.
FIG. 7. *Tridrepana finita* sp. n., holotype ♂.
FIG. 8. *Tridrepana sadana* (Moore), ♂.
FIG. 9. *Tridrepana thermopasta* (Hampson), holotype ♂.
FIG. 10. *Tridrepana maculosa* sp. n., holotype ♂.
FIG. 11. *Tridrepana marginata* sp. n., holotype ♂.
FIG. 12. *Tridrepana fulva* (Hampson), holotype ♂.
FIG. 13. *Tridrepana flava flava* (Moore), ♂.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